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A MANUAL ON CATTLE

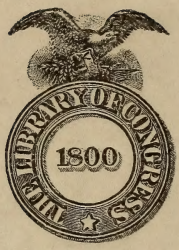
BY

J. T. HENDERSON

COMMISSIONER AGRICULTURE

GEORGIA

JAMES P. HARRISON & CO., PRINTERS,
ATLANTA.



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A

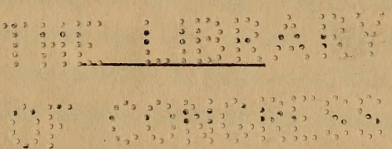
MANUAL ON CATTLE:

FOR THE USE OF

THE FARMERS OF GEORGIA.

PREPARED UNDER THE DIRECTION OF

J. T. HENDERSON,
COMMISSIONER OF AGRICULTURE FOR THE STATE OF GEORGIA.



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INTRODUCTION.

THE Act establishing this Department, approved February 28, 1874, section 7, defining the duties of the Commissioner of Agriculture, says: "Said Commissioner shall report, as hereinbefore set forth, upon any matter of interest in connection with the dairy, that he may deem of interest to the people of this State."

While this section relates particularly to "matter of interest in connection with the dairy," this work will not be confined to the dairy, but will treat the general subject of cattle-raising in Georgia, in such manner as will convey to the reader, in the most condensed form, the information needed by every owner of cattle to insure profit and guard against loss by disease and neglect. The reception accorded the "Manual of Sheep Husbandry in Georgia" and the "Manual on the Hog," by the reading public, inspires confidence that one on the Cow, in which every family, however humble, is interested, will not be an unwelcome visitor to the homes of the farmers of Georgia.

The facts connected with rearing cattle in Georgia, with the practice pursued by stock-raisers in different parts of the State, have been collected in the usual manner by means of questions sent to those best informed, on the subject in hand, in every county.

The answers to some of these questions have been consolidated and the results given; others have been used as the basis of remark.

The leading authors on cattle have been liberally consulted and the information derived from them blended with the results of a large experience and extensive observation, condensed into the smallest space compatible with perspicuity, and made applicable to the circumstances by which the farmers of Georgia are surrounded.

Reference has been made to "Flint on Milch Cows and Dairy Farming," "Youatt & Martin on Cattle," "American Cattle," by Allen; "American Cattle Doctor," by Dadd; "How to Select a Cow," by Willis P. Hazard; "Practical Butter Book," by Willard; "The Dairy Cow—Ayrshire," by Sturtevant; "Practical Dairy Husbandry," by Willard; "Cattle, their Breeds, Management, and Diseases," by Youatt; "Soiling Cattle," by Quincy; "American Dairying," by Arnold; "Grasses and Forage Plants," by Flint; and Howard's "Manual of the Cultivation of Grasses and Forage Plants." Free use has been made also of such illustrations found in these works as suited the purpose of this. This method is taken of making proper acknowledgments for assistance derived from these works, which are recommended to those who desire to make a thorough study of the subjects on which they treat.

A MANUAL ON CATTLE.

CHAPTER I.

QUESTIONS ON CATTLE RAISING IN GEORGIA.

The following questions were sent to stock-breeders in every county in the State for the purpose of collecting facts from their experience and observation :—

1. What distinct breeds of cattle have you tested?
2. Which have proved most profitable?
3. What crosses have you tested?
4. Which have proved most profitable?
5. How many cattle do you keep?
6. What kind do you breed at this time?
7. What breed or cross have you found most profitable for beef?
8. What breed or cross gives the largest yield of milk?
9. What breed or cross gives the largest yield of butter?
10. What breed or cross do you recommend for general purposes, or combination—for beef and dairy?
11. Give the results of any experiments that have been made in your county in the production of cheese?
12. What is the annual average cost, per head, of keeping cattle in your county?
13. What per cent. per annum, on the investment and annual cost of keeping, do they pay?

14. What is the average daily yield of milk to the cow?
15. What is the average quantity of milk, in pounds or quarts, required to make a pound of butter?
16. Give the results of any experiments that you have made, to test the effects of different kinds and combinations of food, on the flow of milk, and the quantity and quality of butter?
17. What is the average price at which butter sells in your county?
18. What is the average price per pound, net, at which beef sells in your county?
19. What is the average price per pound, gross, at which beef sells in your county?
20. What is the average weight of beef cattle, as they are sold in your county?
21. What is the average price at which milch cows sell in your county? Report also maximum and minimum prices.
22. What summer pasturage have your cattle?
23. Give the results of experiments, if any, in your county in soiling cattle.
24. Give the results of experiments in tethering out cattle on grass?
25. How do you rank Bermuda grass as pasture for cattle?
26. Do you feed your cattle in winter?
27. If so, on what do you feed them principally?
28. How long do they require it?
29. If not fed, on what do they subsist during winter?
30. What crop yields the largest amount of forage for winter food at the least cost?
31. What for feeding green in summer?
32. Do you pen your cattle at night?
33. Do you pen them on cultivable land, or in permanent pens in which the manure is saved to be hauled out?
34. Give facts as to the area annually fertilized by a given number of cattle, so as to double the crop?

35. Give facts as to the results of soiling in the production of manure?
36. Give facts as to results attained in crops produced from manure saved from cattle.
37. Give facts as to the quantity of manure saved per head from cattle penned, under shelter, with the usual mixture of litter.
38. Give the results of experiments in dairy farming—cost, yield, and profits.
39. What diseases have proved most destructive to cattle in your county?
40. What remedies have been successfully used? Describe each disease and its remedy.
41. What per cent. of cattle in your county are annually lost by disease?
42. What breed or cross gives the best work oxen for farm use?
43. Have you used beef, corned or pickled, as a substitute for bacon on the farm?
44. If so, give the result of your experience as to its economy.
45. Do you select heifers to be reserved for milch cows, with reference to the "escutcheon" or "milk mirror," according to the Guenon system?
46. What has been the result of your observation as to the correctness of the sign as indicating milking properties?
47. At what age do your heifers commence to breed with best results?—for dairy purposes? At what for beef?
48. To what age do you find it profitable to keep milch cows?
49. What is the per cent. of increase per annum in calves, on the number of cows kept?
50. Do you allow the calves to suck their mothers, or do you raise them by hand from their birth?

51. Which plan has given better results?
52. What are the principal obstacles to successful cattle raising in your county?
53. What remedies do you suggest?
54. Give any other information in your possession, that may be of value to the farmers of Georgia.

CHAPTER II.

FACTS ELICITED FROM THE QUESTIONS ON CATTLE RAISING IN GEORGIA.

The following breeds are reported as having been tested to a limited extent, viz.:

Short Horn, Devon, Ayrshire, Hereford, Brahmin and Jersey, the Devon and Jersey being the only ones that have been tested to any extent as thoroughbreds. There are only a few herds of Devons and only about two dozen herds of Jerseys. The great majority of tests, however, have been limited to the introduction of thoroughbred males which were crossed upon the common cows.

In fact, therefore, the Devons and Jerseys are the only breeds proper which have been tested to any extent as such, the test of others having been confined principally to their grades. There have been no thorough comparative tests of the different breeds to ascertain which is best adapted to the farm in different parts of the State, the readiness with which sales of the offspring could be made, having generally been the controlling influence in determining the variety kept by the principal breeders.

There has been to some extent comparative tests of grades, but these have been too general in their character to afford the data necessary to the formation of intelligent

opinions of their comparative merits and profits. Few simultaneous tests have been made under circumstances which enabled the breeder to keep accurate records of the cost, yield and profits of the different breeds, crosses or grades, and hence the reports of "which have proved most profitable" being based upon mere casual observations of tests, made probably at considerable intervals of time, are mere opinions, and not absolute facts. The opinion, however, is almost unanimous in favor of the pure breeds and their grades as improvements upon the common stock.

The average number of cattle kept by the correspondents is twenty-nine, and with few exceptions they are now breeding either grades or common stock, known as "natives." They report grades of Jersey, Devon, Short-Horn, Ayrshire, Brahmin, Hereford, the crosses of some of these; and a few the thoroughbred Jersey, Devon, Ayrshire or Short-Horn.

A few report a little cheese made for family use, but none for market.

The average annual cost per head of keeping cattle is five dollars. This varies from nothing in Southern Georgia to as high as thirty dollars in one instance in North Georgia. Where the high cost is reported, reference is made to milch cows, which are fed through the larger part of the year. A large majority of those who report any cost at all, range from two to five dollars per head.

They report an average annual profit per annum of forty per cent. upon the investment and the annual cost of keeping cattle. The average daily yield of milk, per cow, for the whole State, is reported at five quarts; and the average quantity of milk required to make one pound of butter is reported at ten quarts.

The average price received for butter per pound is twenty cents.

The average price per pound of beef sold from the farm is, net, five cents; gross, two and a quarter cents.

The average net weight of beef cattle, as sold from the farm, is reported at three hundred and forty-two pounds.

The average price at which milch cows sell in the State, is reported at $18.32, the reports ranging from $8.00 to $100.00, as minima and maxima prices.

The maximum is for common cows giving extraordinary yields of milk, or for thoroughbreds.

The minimum is reported from those sections where but little attention is paid to milch cows, as such, but where the principal attention is given to the production of beef.

For summer pasturage, the native grasses, embracing wire grass, broom sedge, Bermuda,* crab grass, and other varieties of less note, are used.

Many report the "range," which means that their cattle run out during summer on the commons and in the woods, some of which afford very superior pasturage during the late spring and early summer months, and, except in cases of severe drouth, throughout the season.

A few only report inclosed pastures of clover, orchard grass and herds grass.

All who have utilized Bermuda grass concur in the opinion that it is unsurpassed for summer pasturage, a large majority reporting it "the best."

Very few have experimented with soiling or tethering cattle, but those who have tried either generally report favorably as to results.

Milch cows and calves are fed during the winter in every section of the State from one to six months, according to latitude, but in Middle and Southern Georgia dry cattle are fed but little, especially where they have access to the wild cane along the creek and river bottoms.

Among the substances reported as fed to cattle in winter are shucks, corn-fodder, oats, straw from small grain and

* Bermuda, though not a native, is generally so classed because it grows spontaneously.

rice, cane-fodder, cotton-seed, turnips, peas and pea-vines, barley cut green, crab-grass hay, German millet hay, clover and grass hay, rice flour and sweet potatoes.

When not fed, they have the range of the whole plantation except the small grain fields, and subsist upon the gleanings of the fields and upon the wild cane and grass about the creeks.

In answer to the question, "What crop yields the largest amount of forage for winter food, at the least cost?" a large majority report drilled corn; some report pea-vines, some crab grass hay; some, the millets; some, turnips, and others clovers and the cultivated grasses.

For feeding green in summer, the majority report in favor of cat-tail millet; some in favor of drilled corn; some, peavines, and others clover.

All the correspondents report penning their cattle at night during the whole or a part of the year; some on cultivable lands, and some in permanent pens from which the manure is collected and carted out to the fields.

None have conducted accurate experiments as to the amount of manure annually saved per head, or the area annually fertilized by a given number of cattle so as to double the crop. All, however, testify very strongly as to the great value of cow manure, many giving it a decided preference over that from horses on account of its conservative action upon summer crops in our climate.

No accurate experiments as to the "cost, yield and profits" of dairy farming have been made, and, except in the immediate vicinity of the cities, no strictly dairy farming has been done.

Forty correspondents report no destructive disease; forty-one report murrain or redwater; many make no report at all on the subject. Some report no disease since 1860. Others report no disease since the black tongue prevailed in 1856. There is perhaps no country in which cattle are more remarkably exempt from disease than in Georgia.

The annual loss by disease in the State is reported at 4½ per cent., but many of the most intelligent correspondents say that many cases of death which are attributed to disease are the result of neglect, and often of starvation, during winter.

Very few have given any attention to the selection of heifers to be reserved as milch cows with reference to the "escutcheon" or "milk mirror," according to the Guenon system. Those who have experimented in such selection, almost without exception express the opinion that its indications are generally correct.

Quite a number say they make no selection, but reserve all of the heifer calves as breeders. This is especially true of the southeastern portion of the State, where large herds are kept on what is known as the wire grass range.

Heifers are generally allowed to breed at will and commence at from two to three years of age.

Milch cows are kept in use from ten to fifteen years.

The per cent. of increase in calves per annum, on the number of cows kept, is sixty-five.

Very few report raising calves by hand. Those who have tried it, however, report in its favor, almost without exception, and many who do not practice it say it gives better results than allowing them to suck their mothers.

In answer to the question, "What are the principal obstacles to successful cattle raising in your county?" nearly all of the correspondents say none, except neglect on the part of farmers to supply the necessary pasturage and to bestow proper attention upon their stock.

The rearing of cattle being merely incidental to other more important branches of agriculture, on the part of most farmers in the State, but little attention is bestowed upon them further than to secure a supply of milk and butter for family use, and the cattle generally being allowed to run out on the commons, the owners of the cows have

no choice of the sires of their calves. Occasionally, enterprising breeders are so generous as to turn improved bulls out for the public good, to the material advantage of the stock of the neighborhood, but such are exceptional cases.

CHAPTER III.

HISTORICAL SKETCH.

While we have no authentic history of the early usages in the management of cattle, we have both in sacred and profane history repeated mention of the ownership of cattle. In the fourth chapter of Genesis, 20th verse, we read that Jabel "was the father of such as dwell in tents, and of such as have cattle." It would seem, therefore, that the owners of cattle in that day, which was during the lifetime of Adam, led a pastoral life and dwelt in tents. Later, after Jacob, the most noted cattle-breeder of ancient times of whom we have any record, had left Laban, whose herds he had tended for twenty years, we read in Genesis, chapter 33, 17th verse, "And Jacob journeyed to Succoth, and built him a house, and made *booths* for his cattle." Succoth has about the latitude of Savannah, Ga., and yet this veteran stock-breeder saw proper to make "booths" for his cattle.

Though Abel is spoken of as "a keeper of sheep," the word sheep is supposed to be used as a generic term representing different kinds of domestic animals.

It is a well settled fact that the use of cattle as domestic animals is coeval with man's existence on this globe, and that in the early stages of man's development and progress towards civilized life, cattle have been largely relied upon as a source both of food and profit.

Profane history is equally clear in representing the domestication of cattle, since they were objects of worship among the Egyptians and of veneration among the Indians. The traditions of the Celtic nations, as well as the sculptures of the Egyptians, place cattle among the earliest productions, and represent them as constituting, as in the days of Abraham and Jacob, one of the principal elements of the wealth of nations and individuals, and continued so until agriculture became more generally practiced, when less attention was given them, until within the last two centuries, when they received more attention, and improvement commenced.

When Julius Cæsar invaded Britain, he found the Britons neglecting tillage and living principally upon milk and flesh.

The unsettled political condition of the country at that time, and the consequent insecurity of property, made that class of property which could be removed to a place of security with the greatest expedition most desirable. Cattle being of this class, and but little tillage practiced, the Britons relied mainly upon them for food, not only during the baronial period, but even after one sovereign reigned over the whole kingdom. Contests at arms being still of frequent occurrence, and fixed property consequently insecure, the rearing of cattle continued to be the leading pursuit of the people.

When the political condition of the country became more settled, agriculture received more attention and the rearing of cattle less, until within the last two centuries, when a few breeders commenced improving their stock by judicious crossing and selection.

There are two remarkable facts in connection with the history of cattle in England;

1st. The number of breeds with distinctive characteristics in a territory of such limited extent.

2d. That the first classification of cattle should have had reference entirely to their *horns.*

The former was perhaps due principally to selection and close breeding without intermixture from other sections, as well as to the variety of climate and pasturage in different sections of the kingdom. Indeed, we are told by Youatt that the Glamorganshire farmers "admitted of no mixture of foreign blood."

On this subject Mr. Youatt says:

"The breeds of cattle, as they are now found in Great Britain, are almost as various as the soil of the different districts, or the fancies of the breeders. They have, however, been very conveniently classed according to the comparative size of the horns; the *long horns*, originally from Lancashire, much improved by Mr. Bakewell, of Leicestershire, and established through the greater part of the midland counties; the *short horns*, mostly cultivated in the northern counties and in Lincolnshire, and many of them found in every part of the kingdom where the farmer attends much to his dairy or a large supply of milk is wanted; and the *middle horns*, not derived from a mixture of the two preceding, but a distinct, valuable and beautiful breed, inhabiting the north of Devon, the east of Sussex, Herefordshire, and Gloucestershire; and of diminished bulk, and with somewhat different character, the cattle of the Scottish and the Welsh mountains. The Alderney, with her *crumpled horn*, is found on the Southern coast, and in smaller numbers in getlemen's parks and pleasure grounds everywhere; while the polled, or *hornless* cattle, prevail in Suffolk and Norfolk, and in Galloway, whence they were first derived."

The *middle horns* seem to have been the original breed of British cattle, the *long horns* of Irish extraction, the polls though they have "existed in certain districts from time immemorial, were probably an accidental variety."

The short horns lay no claim to this honor, having had their origin in careful selection, a little more than a century ago.

The improvement in the form, beauty and adaptation of cattle to the uses of man during the last century has been most remarkable, and has been effected by careful and skillful selection of breeding animals and judicious crossing. Indeed the different varieties have been so bred as to develop peculiar characteristics and adaptation to specific purposes, as well as to combine such characteristics into one harmonious whole in the same breed.

IN AMERICA.

The first introduction of cattle was by the Spaniards, about 1525, into Mexico; the next into Virginia in 1610 and 1611 from England. They were introduced into New York from Holland in 1625, and into Massachusetts from England in 1624. The Dutch settled New Jersey in 1624, and the Swedes, Delaware in 1627, and brought their cattle with them. In 1631, 1632 and 1633, cattle were imported into New Hampshire from Denmark. English cattle were brought into Maryland in 1633, into North Carolina in 1660, into South Carolina in 1670, and into Pennsylvania in 1682. Georgia was not settled until 1732, and there is no record of the introduction of cattle at that time. It is probable that the first that were brought into the State came with settlers from other colonies.

CHAPTER IV.

DIFFERENT BREEDS AND THEIR CHARACTERISTICS

Before proceeding to the discussion of the different breeds it will be well to define definitely some of the terms which will occur in this chapter.

A BREED is a race, class or kind of animals, having certain peculiarities of form and other characteristics different from others of the same family.

THOROUGHBRED animals are those which have been bred in a direct line sufficiently long to establish a fixed type which they have the power of transmitting with uniformity to their offspring.

FULL-BLOOD.—In Kentucky the results of the sixth cross are called *full-blood.* This should not be confounded with *thoroughbred,* as an animal that is called *full-blooded* is only 63-64 of the blood of the thoroughbred used in the cross. Thus the first cross of a thoroughbred bull on a "native" cow, produces a half breed—the next cross of the thoroughbred on the half breed produces 3-4, the third cross of thoroughbred, on the 3-4 produces 7-8, on 7-8, 15-16, on 15-16, 31-32, on 31-32, 63-64, which is called *full-blood.* The uninitiated are liable to be, and sometimes have been, imposed upon by confounding full-blood with thoroughbred.

CROSS-BRED animals are the offspring of a thoroughbred male of one breed out of a thoroughbred female of another.

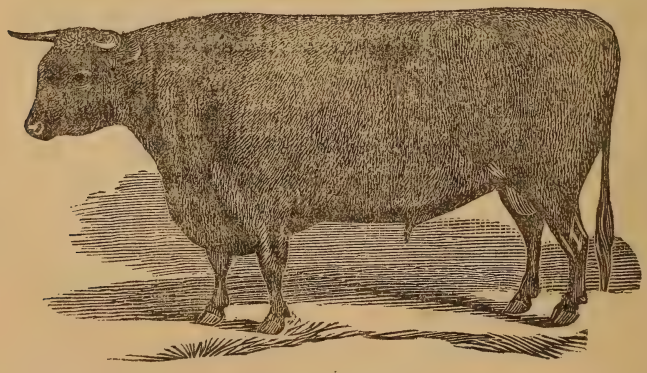
GRADES are the offspring of a thoroughbred male or female, and what are known as common stock, which belong to no particular breed; or any other than thoroughbred or cross-bred.

HIGH GRADES are those having a preponderance of pure blood, such as the offspring of a thoroughbred bull out of a half-blood cow, which is called three-fourths. Full-blood animals are high grades.

LOW GRADES embrace half breeds and all the gradations below, so long as the impress of the thoroughbred is visible.

"COMMON STOCK," "SCRUBS" or "NATIVES" are those which have been indiscriminately bred until there is no recognizable trace of any breed and no uniformity of type. To this class belong nearly all of the cattle in Georgia.

The only breeds which are bred pure in America, are the Devon, Durham or Short-Horn, Ayrshire, Jersey, Alderney, Holstein or Dutch, and Hereford. In Europe, the Angus Polled, the Galloway, and the Scotch Highland are highly esteemed, but, as yet, none of consequence have been imported into and bred pure in this country. We have polled cattle in America, and in Georgia, but none have been bred pure on this side of the Atlantic.



Devon Bull.

DEVONS.

This beautiful race of cattle is of such great antiquity that there is no record of their origin; some claiming that they date as far back as the Roman conquest.

The Devons occupy the relation to other breeds of cattle that the Southdown does to other breeds of sheep, and the Essex to other breeds of hogs. No other breed is more fixed in its type, none more distinct, none of greater antiquity, and none with more points of excellence as a combination animal. There are some that excel them as beef producers, others as butter producers, and others still at the pail; but no other breed equals them in symmetry of form, uniformity of type, or as combination beef, dairy, and work animals. Allen in his work on American cattle, describes the typical Devon as follows:

"The head, lean in flesh, is rather short, the forehead broad, the face slightly dishing, and tapering gracefully to a fine, clean *yellow* muzzle. The eye, bright, prominent, and surrounded by a ring of orange colored, or yellow skin. The horn, upright and curved outward, cream colored, black at the tips, graceful in its setting, and rather long, for the size of the animal. The ear, well set, and lively in action. The neck, on a level (in the bull slightly arching) with the head and shoulders; full at its junction with the breast, clean, and without dewlap. The shoulders, fine, open (somewhat slanting, like those of the horse), and on a level with the back. The neck-vein, full, and smooth. The arm, delicate, and the leg below the knee, small, terminating in a clean, dull brown, and somewhat striped hoof. The brisket, full, and projecting well forward. The crops, well filled, and even with the shoulders. The back, straight from the shoulders to the tail. The ribs, springing out roundly from the back, and running low down, to enclose a full chest, and setting well back towards the hips, giving a snug neat belly. The flanks full and low. The hips wide, and level with the back. The loin full and level. The thigh well fleshed and full, the lower part somewhat thin, and gracefully tapering to the hock; the leg below, small, flat and sinewy. The twist (the space be-

tween the thighs) well let down and open. The tail tapering like a drum-stick, and terminating with a brush of *white* hair. The color, invariably cherry red, sometimes showing a lighter, or deeper shade, and the skin, under the hair, a rich cream color. The bull, of course, will show the stronger and masculine character of his sex, while the ox will develop the finer points of his condition, and the cow, all the delicacy and refinement belonging to her race."

The earliest records of the Devon as a breed show that from time immemorial they were bred in the Northern part of Devonshire, whence the name of North Devon.

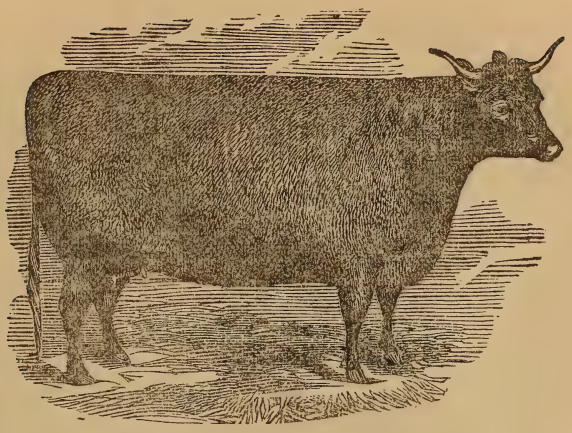
They have since spread into other counties of England and been imported in considerable numbers to America. Unlike other breeds of more modern origin, there seems to have been no infusion of other blood of which there is either history or tradition. By selection, their size has been somewhat increased, their beef producing qualities improved, and their milking qualities diminished thereby.

AS WORK OXEN,

All things considered they have no superior for ordinary farm use. They are muscular, active and durable. Their uniformity of color and type causes them to match readily and when turned off for beef they fatten readily and produce beef of fine quality.

AS A MILCH COW,

The Devon may be classed as medium in the quantity and superior in the quality of yield. The yield depends, of course, somewhat upon the object for which they have been bred. In herds in which selection has been made with a view to the development of milking properties they have made good records, while in others in which the production of beef was the leading object they have deteriorated as milkers.



Devon Heifer.

They are docile, easily kept, managed without difficulty and so tidy in form and appearance that the owner has every inducement to bestow proper attention upon them.

A few parties have been breeding the Devon in Georgia for years with satisfactory results. Correspondents from Burke county speak in especially favorable terms of the Devon. Mr. J. B. Jones, of that county, says: "For Middle, South, Southeast, and Southwest Georgia, I would breed only Devons for any and all purposes."

Dr. W. B. Jones, of the same county, says: "Grades of any good breed are more profitable than natives; thoroughbred cattle, of any class or breed, means thorough keeping and feeding. Grades are much hardier than natives, and for milk, beef or work oxen, Devons have proved to me to be the cattle fitted for my especial latitude and climate."

A large number of common cattle, especially in Middle Georgia, which are known as "red English" are thought to be the result of a remote cross of the Devon on the "Natives." It is proper to say that the "red English" are highly esteemed wherever they are found in Georgia.

for their good qualities at the pail, on the shambles or under the yoke.

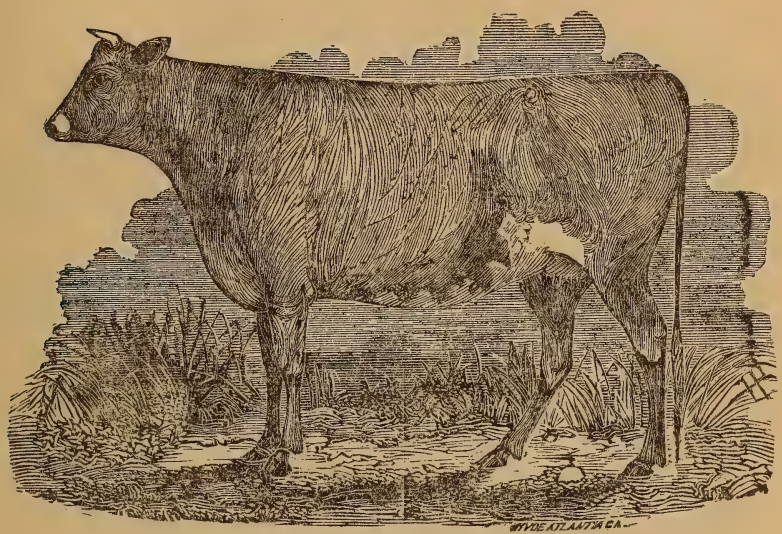
The Devon breed of cattle is of such antiquity, and consequently so firmly fixed in type, that it gives a very decided impress upon its offspring even when crossed upon very inferior animals, and hence the improvement resulting from their cross is perceptible even after the source of the improvement has been forgotten. In speaking of the Devon,

AS A BEEF ANIMAL,

Allen says: "We must place the Devon in the first class, for fineness of flesh and delicacy of flavor. Its compact bone gives it the one, and its rapid and thorough development under good feeding gives it the other. In growth and size it matures early, equal to the Shorthorn, and its meat is finer grained, juicy and nicely marbled (the lean and fat intermixed).

In the London markets, Devon beef bears the highest price of any except the Highland Scott—usually a penny a pound over that of the larger breeds, and our American butchers quickly pick the Devons from a drove, when they can find them, before most others. They feed well, take on flesh rapidly, and in the quality of their flesh, are all that can be desired."

The first importation of Devons of which there is any record was made by Messrs. Caton and Patterson, of Baltimore, Maryland, in 1817. There have been various importations since, but they have never excited the enthusiasm that the Shorthorns have in some sections and the Jerseys in others.



Jersey Heifer, LADY BARON; Herd Register, 10,109; Property of R. PETERS, Atlanta, Ga.

CHANNEL ISLAND CATTLE—ALDERNEY, JERSEY, AND GUERNSEY.

This valuable breed of dairy cattle is supposed to have come originally from Normandy in the Northern part of France. They were formerly called Alderneys from the fact that the first that were introduced into England were sent from the Island of Alderney by some officers of the British army as presents to friends in England.

From this circumstance all of the channel island cattle were for a time called Alderneys, notwithstanding the fact that twice as many are exported from Jersey as from Guernsey, while very few are exported from Alderney.

Jersey contains 39,580 acres, 25,000 of which are in cultivation. Its population in 1861 was 56,078. Guernsey has 15,560 acres, 10,000 of which are in cultivation. Its population in 1861 was 29,780. Alderney has only 2,500 acres of which 1,500 are cultivated. Its population in

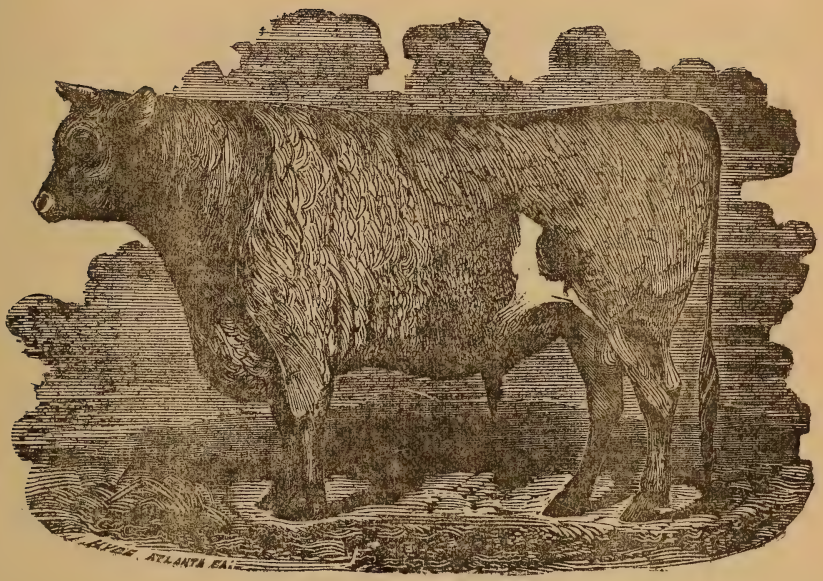
1861 was 4,933. The impropriety of the Island of Alderney giving name to the cattle from all of the islands is therefore apparent. The cattle from Alderney and Guernsey are somewhat larger in size and coarser in type than those from Jersey. So few, however, are reared on Alderney that they are hardly worthy of consideration.

The large majority of Channel Island cattle now in America are either importations from the Island of Jersey or their descendants, and the name of Jerseys is now often applied to all the Channel Island cattle, as Alderney was at first.

The Alderneys, Guernseys and Jerseys are all remarkable for the richness of their milk and the large quantity and superior quality of the butter produced from it.

With few exceptions, the importations into Georgia have been of the Jerseys proper. They are emphatically butter cows, and are no doubt the "best breed" for Georgia where the production of "gilt-edged" butter is the object of the breeder, provided he is willing to bestow the necessary attention upon them. If the sale of milk is the object, other breeds will prove more profitable to the dairyman, but even in that event it may be advantageous to keep several Jerseys to every eight or ten of other breeds to give richness and color to the whole of the milk.

There are some very fine herds of Jerseys in Georgia, and the number is being rapidly increased by purchase from the best herds of the Middle and Eastern States. The great docility of Jersey cows peculiarly fits them to become family pets, and their marked difference of type from the common stock of the country, and their blood-like appearance, impresses the observer with their purity and superiority of breeding. There is a characteristic expression of meekness and gentleness of disposition about the Jersey cows possessed by no other breed.



Jersey Bull, "Baron of Belmont;" Herd Register 4,821; Property of R. Peters, Atlanta, Ga.

Taking the best herds seen in this country, which probably have as high qualities of breeding and excellence as those on their native Island, some of which, indeed, were direct importations, the following description will enable even the novice to recognize the thoroughbred Jersey:

The head is fine and tapering, muzzle black or dark-brown, sometimes yellowish with a ring of lighter color encircling it and shading off to a darker color towards the head; the jaws clean, throat tapering and free from dewlap. The neck is usually a little drooped, sometimes "ewe-necked," but many of the best specimens now straight from the rump to the horns. There is a peculiar mealy appearance about the lighter colors on the face, belly, legs and twist, gradually shading off into a darker, smoky hue above. The ears are rather large for the size of the animal, and hang off from the head in a peculiar

manner—they should be of a rich orange color within. The horns curved inward, small, waxy towards the base and black towards the ends. There is a peculiar deer-like, blooded appearance about the head. The shoulders are wide and prominent, tapering down to delicate, trim legs. Fore quarters somewhat thin, and ribs a little flat and deficient in arch; belly deep and large; hips wide apart; thighs thin, twist wide, affording room for a capacious udder, which is square, reaching well forward, teats rather small, but standing well apart and tapering gracefully. The modern Jerseys have much more symmetry than those of twenty years ago, the best specimens having the peculiar wedge shape, tapering from their hips forward, so indicative of good milkers.

The color varies with the fancy of breeders, from a light fawn to a smoky gray and even black, sometimes splashed with white, but the skin should be invariably yellow.

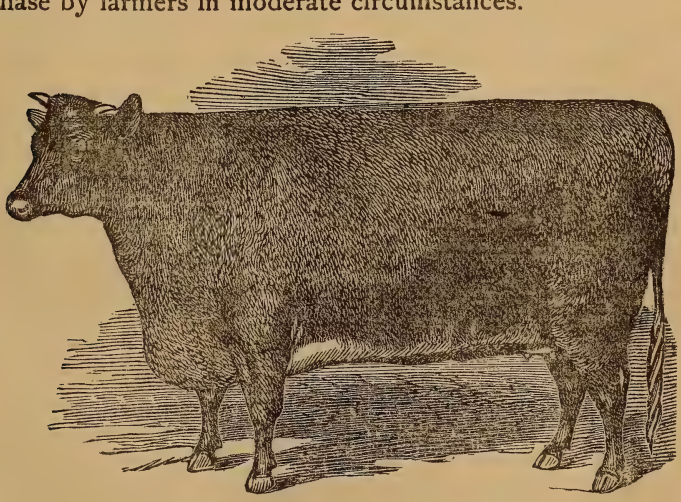
The bull will of course have the masculine features peculiar to his sex, and though the cows are noted for their docility and amiability, the bull is usually vicious at two years of age and often dangerous as he grows older.

A Jersey ox is seldom seen as yet in this country, and though they may feed well and make a moderately fair quality of beef, no one would seek the Jersey for either work or beef animals. Their peculiar use is for butter production, in which they excel. As a pet in a gentleman's lawn, or in a family dairy, they are unrivaled, or even in a dairy the object of which is to make high-priced butter, they excel any other breed; but the chief profit at present from breeding thoroughbred Jerseys is derived from the sale of young animals. They have not been sufficiently tested in Georgia to determine to what extent they are adapted for general purposes of the farm, but it is believed that a cross of Jersey bulls on our common cows will materially improve the cattle of the State, especially in butter production.

BUTTER YIELD OF JERSEY COW EUROTAS.

This remarkable cow, Eurotas, H. B. Register, 2454, has been on trial nine months and six days to August 9th, during which time she has yielded, by actual and accurate weight, 706 pounds and 3 ounces of butter. The test was commenced on the 10th of November, 1879; the last report was to August 15th. Her largest yield was June 15th and 16th, when she yielded in the two days six pounds and six ounces, or three pounds and three ounces per day. It will be observed that the greater part of the test was made during the winter and spring when she had no green food.

The high price at which the thoroughbred Jerseys sell will, for some time at least, prevent their very general purchase by farmers in moderate circumstances.



Short Horn Heifer of Beef Strain.

SHORT HORN, OR DURHAM.

This magnificent breed of cattle has, during the present century, received more attention in England and America than all others together. They seem to have originated as such in Durham county, England (whence the name, Dur-

ham), on the river Tees (whence the name, Teeswater), which divides the county of Durham from that of York. They are supposed to have come originally from the northern part of Denmark, at the time of the conquest by the Danes of the northeastern coast of England.

They seem, therefore, to have had the same origin as the Dutch or Holstein cattle, now so celebrated for their large yield of milk.

As early as 1738, Milbank and Croft were noted as cattle-breeders, but not until the time of the Collings, about 1780, was the great merit of the short horns brought prominently before the public. Mr. Charles Colling adopted an efficient method of advertising the breed, and especially his own herd.

He reared an ox of extraordinary size, and sold him, when five years old to a Mr. Bulmer, to be taken "around the country for exhibition." His live weight was then 3,024 pounds. After traveling with him for five weeks, Mr. Bulmer sold the ox to Mr. Day, who traveled with him nearly six years. He was butchered when eleven years of age, after he was much reduced by the effects of an accident—the dislocation of his hip bone—and weighed, carcass, tallow and hide, 2,620 pounds. Mr. Colling afterwards fed a thoroughbred heifer, which was exhibited in the same way through the country. She was known as the "White Heifer that traveled." When slaughtered, her live weight was estimated at 2,300 pounds.

Through the exhibition of these remarkable cattle, public attention was directed to the merits of the Short Horns and to Mr. Charles Colling as a breeder, who thus acquired such celebrity that he soon realized a fortune from the sale of his stock.

The first importation of Short Horns into America, of which we have record, was made by a Mr. Miller, of Virginia, in 1783. These were celebrated as milking stock.

Some of the decendants of these were taken to Kentucky in 1797 by Mr. Patton, after whose name they were long called the "Patton Stock." Others were carried to the Morefield valley along the south branch of the Potomac, a fine grass region, where they became very celebrated.

They are popular in all the fine grass regions of the United States where beef is the principal object of the breeder.

Some families of them which have been bred with special reference to milk production, have given satisfactory results as dairy animals, but the Short Horn is essentially a beef animal, no other breed that has been introduced into America, except the Hereford, making any pretense to rivalry in this respect. As a combination animal for beef and milk, however the Short Horns far surpass the Herefords, the latter making, however, superior work oxen.

CHARACTERISTICS.

The Short Horns may be divided into two classes; beef and dairy stock. The early importations were selected with reference to their milking properties, and some of them were quite celebrated for their large yields. In the Eastern states, Virginia and East Tennessee, the Short Horns have been bred mainly to the dairy type, while in Kentucky and the Western states they have been bred chiefly for beef.

Where there is a full bite of grass, they make superior dairy animals, and, when turned off, have the advantage over the smaller dairy breeds, in feeding more readily and affording a larger yield of fine beef.

There are few farms in Georgia at present, however, on which the pasturage is sufficiently luxuriant to justify the hope of satisfactory results from the use of Short Horns; the more hardy and active small breeds are better suited to our present condition.

When more attention shall be paid to cultivating the grasses in North Georgia, the Short Horns may be profitably employed in that section of the State, and their grades in other sections.

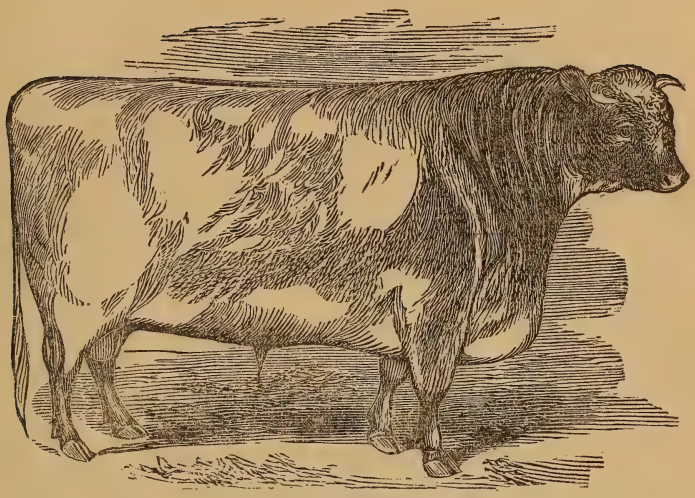
In those states of the Union in which beef is the principal object of the herdsman, the Short Horn of the beef type has been bred at the expense of the milking properties. The earlier importations having been to the Atlantic States, where milk was an important consideration, selections of imported animals were made with reference to their milking properties; and the selections for breeding purposes from their offspring were made with the same view.

The later importations, made after the English breeders, stimulated by the increased demand for beef and enticed by the natural tendency of the Short Horns to beef production, had bred to that end by the selection of the best looking animals for propagating their kind, were mainly carried to Kentucky and west of the Ohio river, where grass was abundant and beef more marketable than dairy products.

Under the same influences, selections were made of the most precocious animals, giving the best promise of beef production.

The influence of selection upon the type of the breed has nowhere been more fully illustrated than in the establishment and perpetuation of the beef and milking strains of Short Horns.

The early maturity of the Short Horns gives them a decided advantage over other breeds. A Short Horn bullock will make more and better beef at two years of age than a native will at four; but the Short Horn to obtain the best development must have abundant food from calfhood to maturity.



Short Horn Bull.

Allen thus described the typical Short Horn:

HEAD.

"The muzzle fine and yellowish, or drab in color, not smoky or black; the face slightly dishing or concave; the eye full and bright; the forehead broad; the horns showing no black except at the tips, and standing wide at the base, short oval shaped, spreading gracefully out, and then curving in with a downward inclination, or turning upward with a still further spread (as either form is taken without prejudice to purity of blood in the animal), of a waxy color, and sometimes darker at the tips; the throat clean, without dewlap; the ear sizable, thin and quickly moving; the neck full, setting well into the shoulders and breast, with a slight pendulous hanging of the skin (not dewlap) just at the brisket; the shoulders nearly straight, and wide at the tops; the shoulder-points, or neck-vein, wide and full; the brisket, broad, low, and projecting well forward, sometimes so much as almost to appear a deformity; the

arm gracefully tapering to the knee, and below that a leg of fine bone, ending with a well rounded foot; the ribs round and full (giving free play to vigorous lungs), and running back well towards the hips; the crops full, but as a rule scarcely equal in fullness to the Devons; the chine and back straight from the shoulders to the tail; the hips *uncommonly* wide, and level with the back and loin; the loin full and level; the rumps wide; the tail set on a level with the back, small and tapering; the thigh full and heavily fleshed; the twist wide; the flank low and full; the hock, or gembrel joint, standing straight (as with a horse), or nearly so; the hind legs, like the fore ones, clean and sinewy, and the foot small.

The dairy strain have less of the rotundity of form than the beef strain, the cows tapering well from rear to front; but when they are turned off they feed readily, and make a large quantity of excellent beef.

The beauty of the Short Horn as a beef animal consists in the small amount of waste in the carcass, either in inferior flesh or in bone, and in the large amount of superior flesh on the most valuable parts.

In color, thoroughbred Short Horns are found pure white, deep red, and with every conceivable mingling of the two, according to the fancy of different breeders.

AS A DAIRY COW

The Short Horns have strong advocates, and where bred with a view to the development of milking properties, they have made good records.

Being large, they of course consume more food per head than smaller milking breeds, but have the advantage of yielding a large quanty of good beef when no longer needed at the pail.

Allen says: "That the *inherent* quality of abundant milking exists in Short Horns, no intelligent breeder of them

need doubt; our own observation in more than thirty years experience with hundreds of them, first and last, under our own eyes, is to ourself evidence of the fact, both in thoroughbreds and grades."

Few men in America, if any, have had so large and varied experience and observation as Mr. Allen, and his testimony is therefore valuable for the section in which he lived (New York). There is no question, however, of the fact that the cross of the Short Horn bull on native cows in Georgia has invariably resulted in an improvement of the stock, both as to milking properties and beef-production.

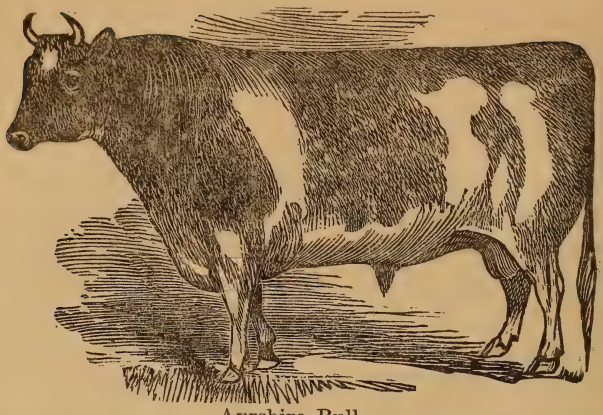
The effects of the introduction of a Short Horn bull into neighborhoods in Georgia, have been observed in the improvement of the stock of the neighborhood for many years afterwards. This is particularly true where reasonable attention has been paid to cattle, and the pasturage is good. In some portions of the United States the milking qualities have been bred out until good milkers are rare. When importations have been made from such herds, there has been a deterioration rather than an improvement in the milking properties of the stock resulting from the cross, while there has been decided increase in size.

Those in Georgia who desire a cross of the Short Horn, should be careful to select from herds that have been bred to milk rather than beef, as the former is generally the leading object in raising cattle in this State.

Before purchasing, however, good pasturage must be supplied, or the Short Horns will rapidly deteriorate.

AYRSHIRES.

The origin of this breed which has become so popular for the dairy, seems to be involved in some degree of uncertainty. They seem to have had for the foundation of the breed the Scotch Kyloe cattle, and improved by crosses



Ayrshire Bull.

of Short Horn and Holderness, and probably with an infusion of "Dutch" blood.

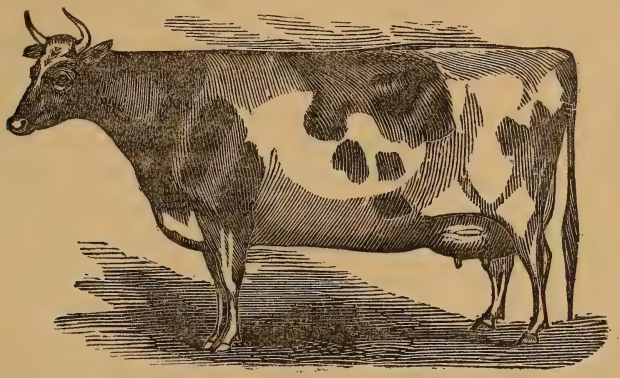
Mr. Allen says: "From no other race of cattle, Scotch, English or Irish, could the *improved* Ayrshires get their shape, color, and milking qualities combined."

They have been bred with special reference to the development of their milking qualities by selecting, for breeding purposes, only the offspring of good cows which gave promise of developing into good milkers. Allen says: "That they are a good breed of cattle, useful, and eminently qualified for the dairy, and capable of perpetuating among themselves their good qualities, are facts now well established both in Scotland and America."

The first importation into America of which we know was made in 1831, and their forty-eight years' trial in this country has been quite satisfactory. They are hardy, healthy, docile, and eminently adapted to our climate and pasturage. They will thrive where the Short Horn or Hereford will rapidly decline in size.

Though their yield of milk is less in our climate than in the more moist one of their native Ayrshire in Scotland, in proportion to their size they yield more milk than any

other breed except, perhaps, the Dutch, or Holstein. Their milk is less rich in cream than that of the Jersey, but it is of fair quality and so far exceeds the Jersey in quantity that the average yield of butter per cow is fine in quantity though inferior in quality to that from the Jerseys.



Ayrshire Cow.

DESCRIPTION OF TYPICAL AYRSHIRE.

In the prize essays of the Highland and Agricultural Society of Scotland, 1866-7, we find the following description of the Ayrshire: "Head short, forehead wide, nose fine between the muzzle and eyes. Muzzle moderately large; eyes full and lively. Horns, wide set on, inclining upwards, and curving slightly inwards. Neck, long and straight from the head to the tip of the shoulder; free from loose skin on the under side, fine at its junction with the head, and the muscles symmetrically enlarging towards the shoulders, shoulders thin at the top; brisket light. Forequarters thin in front, and gradually increasing in depth and thickness backward. Back short and straight; spine well defined especially at shoulders; short ribs arched. Body deep at the flanks; pelvis, long, broad, and straight. Hook loins wide apart, and not much overlaid with fat. Thighs deep and broad; tail long and slender,

and set on level with the back; legs short, the bones fine, and the joints firm. Milk vessel, capacious and extending well forward, hinder part broad and firmly attached to the body; the sole or under surface nearly level. Teats, from two to two and a half inches in length, equal in thickness, and hanging perpendicularly; their distance apart at the sides should be equal to about one-third of the length of the vessel, and across to about one-half of the breadth. Milk veins well developed; skin, soft and elastic; hair, soft, close and woolly; color preferred, brown, or brown and white, the colors being distinctly defined." Brown is a rather deeper shade than is usually seen in this country. Indeed, they are usually described in the herd book as red and white, or white and red, as the one or the other color predominates, and this depending largely upon the fancy of the breeder.

The well developed Ayrshire cow viewed from the front, presents the appearance of a blunted wedge, such is the taper from the hips forward.

They yield readily to kind and gentle treatment, and resent harshness with angry gestures.

They are naturally less amiable than the Jersey cows, but respond as readily to kind treatment, while they are more disposed to resent unkindness.

The annual yield of milk in some of the principal Scotch dairies, in which Ayrshire cows were kept, is reported at from 550 to 1,000 gallons. Ayrshire cattle being of medium size and hardy, are well adapted to Georgia farms, where a reasonable bite of grass is available; and are especially suited to use in dairy farms near cities, where there is a market for milk.

The cross of the Ayrshire bull upon our native cows would rapidly build up dairy herds.

The fact that Ayrshires have the colors usually seen in our common cattle, militates against their introduction,

those not familliar with their type being often suspicious of them as thoroughbreds.

Flint says: "The Ayrshires have been developed to such a degree, that they may be said to produce a larger quantity of rich milk and butter in proportion to the food consumed or the cost of production, than any of the pure-bred races."

So exclusively did the farmers of Ayrshire breed to milk that Aiton says: "The Ayrshire farmers prefer their dairy bulls according to the feminine aspect of their heads and necks, and wish them not round behind, but broad at the hook-bones and hips, and full in the flanks."

HEREFORDS.

This breed takes its name from Hereford, a county in the western part of England, where they are said to have originated.

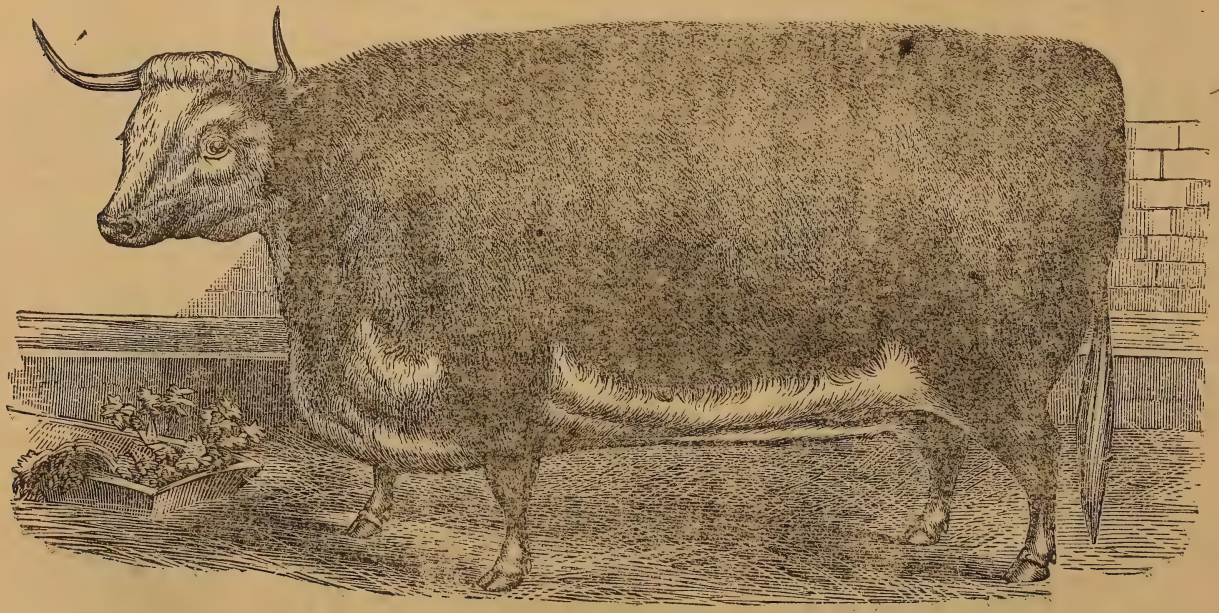
Their improvement seems to have commenced about the middle of the last century. They were formerly of a brownish red color with mottled faces.

The most fashionable color now is pale red with white faces, the white often extending along the throat, under the brisket and belly, and along the back. The origin of the white face is thus accounted for by Mr. Rowlandson, in his "Farming of Herefordshire:"

"About the middle of the last century (1750), the cowman (of the herd of Mr. Tully) came to the house, announcing as a remarkable fact, that the favorite cow had produced a white-faced bull calf. This had never been known to have occurred before, and as a curiosity, it was agreed that the animal should be kept and reared as a future sire." He further remarks that "the progeny of this very bull, became celebrated for white faces."

The Herefords are quite celebrated in England as beef producers, and have their advocates in America, but

Hereford Bull, "Seventy-Six," of the Herd of John Merryman, Esq., Baltimore, Md.



Hereford Prize Ox.

have not attained to the popularity that other breeds have, probably on account of their deficiency in milk production. It is an old and well established breed and stamp their type in a marked degree upon their progeny. For years after the use of a Hereford bull upon the common cows of a neighborhood, the effects of the cross are observable in the progeny possessing only one-eighth Hereford blood. Very fine Herefords have been introduced into Georgia—not enough to give them a fair trial. A bull now in use in Clinch county, Ga., is reported to have materially improved the size of the cattle in his neighborhood.

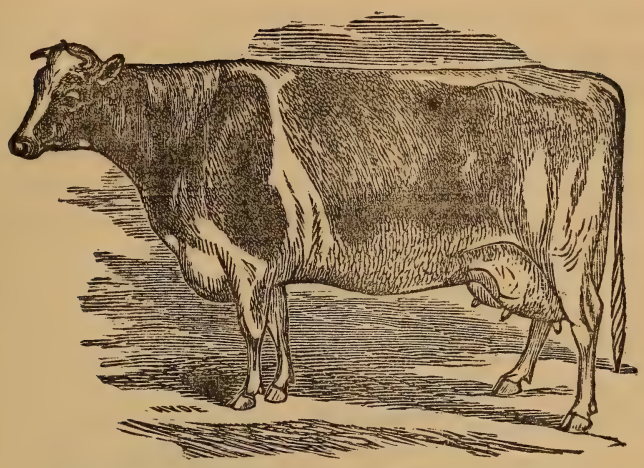
Like the Short Horn, they require a full bite of grass, and are hence not well adapted to sections in which natural grasses are the only dependence for pasturage. When our market facilities for beef increase, and more attention is paid to the cultivation of the grasses, the larger breeds of beef-producing cattle will become more profitable and popular. At present the smaller, milk producing breeds, are better adapted to Georgia, and give better satisfaction.

As beef-producers, the Herefords rival even the Short Horns, under the same circumstances, but the latter are so far superior as milkers, that the partiality already established for them will be difficult to overcome.

THE HOLSTEIN OR DUTCH CATTLE.

Comparatively few of this valuable milking breed have been brought to America, notwithstanding the fact that they have been long celebrated as a dairy breed, and are claimed to have been the source from which the Short Horns and Ayrshires derived their milk-producing qualities.

In color they are black-and-white, not mingled but each color distinctly marked and clear. In form they somewhat resemble the Short Horns of the milking strains, though less rounded in outline. In size they are some-



Holstein or Dutch Cow.

what smaller than the Short Horn. The four cows imported by Mr. Chenery, of Boston, Mass., in 1861, had an average live weight of 1325 pounds.

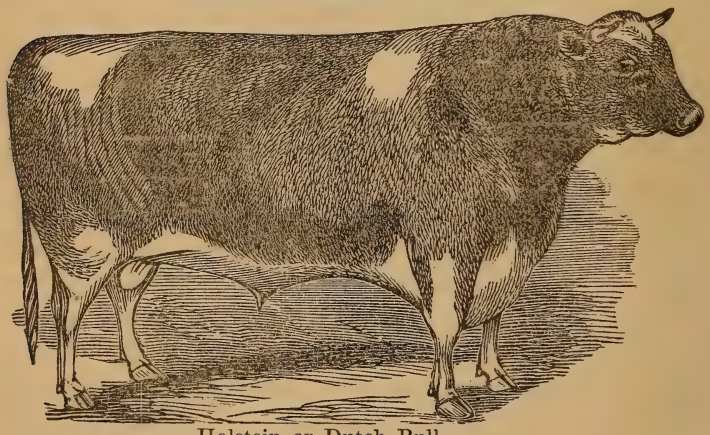
They, as far as tested in this country, have given great satisfaction as dairy stock, their milk being similar in quality to that of the Ayrshire and yielded in greater quantity.

Mr. Allen, speaking of the milking qualities of the Holsteins imported by Mr. Chenery, says: "The milking qualities of the breed may be judged by the following memoranda: one of the imported cows when six years old, dropped a calf on the 15th of May, weighing 101 pounds; and from the 26th of May, to the 27th of July, by a careful and exact record, gave 4018 pounds 4 ounces of milk. The largest yield in any one day, was 76 pounds 5 ounces, (35⅛ quarts.)

"In ten days she gave 744 pounds 12 ounces, or an average of 74 47–100 pounds per day. She gave a good flow of milk during the season, continuing to the 24th of May following, and on the succeeding day droppod twin

heifer calves, which weighed 155 pounds. * * * Six day's milk of this cow were set for cream, and the produce was 17 pounds 14 ounces of good butter, nearly 3 pounds per day, and it is claimed by her owner that she is *not* the *very best* cow of the herd." The milk though in very large quantity is of good quality, and is especially rich in casine. It is not a little remarkable that more of this valuable breed have not been imported into the United States, so satisfactory has been the experience of those who have tested them. The grade heifers by Dutch bulls inherit much of the fine milking qualities of the thoroughbreds.

Judge John L. Hopkins, of Fulton county, Ga., has imported a few of this breed, and is well pleased with them.



Holstein or Dutch Bull.

The fact that their color corresponds with that of many of the native cattle, will prevent to some extent, their rapid introduction, as has been the case with the Ayrshire. An experienced breeder remarks that "while he considered the Ayrshire the most valuable breed he had tested, he could not sell their offspring, because their color corresponded so nearly with that of the native cattle." Their characteristics are not sufficiently distinctive so take the eye of the average farmer.

AS BEEF ANIMALS

The Holsteins have been but little tested in this country, but they are represented as giving satisfactory results where thoroughly tested. Allen says, "A pair of oxen, five years old, gave a live weight of 4,600 pounds, and proved superior workers, showing that they were trained for labor and not for beef alone."

THE GALLOWAYS.

Have never been bred pure, so far as is known, in the United States, but, from the early settlement of this country, their grades have formed no inconsiderable part of what are known under the name of "native" cattle. They are known through the country as "mulies" or "polled" cattle. Apart from their good qualities, which consist in docility, combined with fair milk and beef production, many prefer them on account of their being hornless, and consequently harmless to each other, and less dangerous to those who manage them, than those with horns. Some of the grade polled cattle have made very fine records at the milk pail, where they have been bred for the dairy.

ANGUS POLLED CATTLE.

This fine breed of polled or hornless cattle has not until recently been introduced into the United States. They were brought into especial notoriety as the premium fat cattle at the recent World's Fair at Paris. The country people in Angus call them "humlies" or "dodded" cattle. The attention of breeders on the coast of Kincardineshire, seems first to have been directed to them on account of their docility and the facility with which they fattened. Like the Herefords and the beef strains of Short Horns, they have been bred so persistently to beef that their

milking qualities have declined. They resemble their ancestors, the Galloways, in many respects. Their prevailing color is black with occasional white spots.

WHAT ARE "NATIVES?"

While, of course, there are no native cattle in the proper sense of the term on this continent, by general consent the common cattle of the country, which have been indiscriminately bred for so long that they have no distinctive characteristics, are called "natives." They constitute the great bulk of the cattle of this State, embracing all those which cannot be traced back to pure-bred ancestry. They have no fixed type and though some of their characteristics are transmitted to their offspring, being without uniformity themselves, there is no certainty as to the character of the offspring. They have every variety of form, color and quality; some are superior milkers when well cared for, and when selection is made with a view to the dairy qualities of the offspring for a number of years their improvement is often very marked.

As BEEF ANIMALS they vary as much as in other qualities, some attaining with good treatment, large size and making excellent beef.

As WORK OXEN they are often superior when they attain sufficient size which they will generally do under good treatment.

Among the so-called natives, individuals are often found showing decided marks of improved blood, even in neighborhoods in which there have been no thoroughbred stock for years.

They answer a good purpose, perhaps better than thoroughbreds, under circumstances of neglect and poor pasturage, and under good treatment on abundant pastures, they attain good size, make serviceable work oxen and pay well at the pail. They, and grades of a few of the pure

breeds, will be the dependence in Georgia for many years to come.

Thoroughbred bulls, of either beef or dairy breeds, crossed on large native cows give very superior animals for general farm purposes.

CHAPTER V.

ADAPTATION OF GEORGIA TO THE PRODUCTION OF NEAT CATTLE.

Georgia possesses every requisite for the successful production of neat cattle whether they are grown for the dairy or for beef, if man will do his part.

THE CLIMATE OF GEORGIA embraces a variety ranging from a mean temperature of 64° to 68° F. in the southern, to 52° to 56° F. in the mountainous belts.

On this subject the following extract from the Hand Book of Georgia is appropriate: "In nothing regarding us is a greater mistake made abroad, and indeed, in some parts of our own country, than in the climate, or atmospheric condition of Georgia. The State being in the southern portion of the union, lying between parallels of latitude 30°, 39', 27" (average) and 35°, the stranger naturally concludes that our climate is mild and delightful in winter; and in this he is correct. We have but little snow—in more than half the State none at all for years together. We import or manufacture all our ice, and field work may be kept up at all seasons of the year. The difficulty with strangers is in determining the character of our climate during the summer months.

"The winters being pleasant and genial, they conclude, without further investigation, that the summers must nec-

essarily be hot and sultry. This is a serious mistake, as all will testify who have any practical knowledge of the subject. No finer summer climate is to be found on the continent, east of the Mississippi river, than that of many parts of Georgia, and, as a whole, it will compare favorably with that of the states north-west. Carefully conducted observations, year after year, show that the mean annual temperature of the city of Atlanta, our state capital, is the same with that of Washington City, Louisville, Ky., and St. Louis, Mo., which are from 800 to 880 miles further north.

"The mean annual temperature south of a line drawn across the state from Augusta to Columbus, is between 64° and 68° F.; between the same line and another parallel to it, and running twenty miles south of Atlanta, we have a mean annual temperature between 60° and 64° F.; in another strip of territory, including Atlanta, we have a mean temperature for the year, of between 56° and 60° F. In what is known as upper Georgia, it is between 52° and 56° F., while in the mountains it is below 52° F.

"The mean of Gainesville, in Hall county, and of Clarksville and Mt. Airy, in Habersham county, corresponds with that of central Ohio, Indiana, Illinois, upper Missouri and lower Nebraska." * * * "In explanation of these facts, certain features in the geographical situation and physical conformation of the state must be taken into consideration. In lower Georgia we find the greatest degree of heat in summer, the mercury sometimes rising as high as 96° rarely above that figure. It lies however, between the Atlantic Ocean and the Gulf of Mexico, in close proximity to both and the temperature is greatly modified by the strong currents of sea air which continually pass from one of these great bodies of water to the other. The mean temperature of Savannah, in the south-eastern portion of the state during the months of June, July and August, is 79° to 80°; and in no part of

southern Georgia does the mercury often rise above 90°, whilst in winter it seldom descends to the freezing point. Sun-strokes, so common in the northern and northwestern states, are almost wholly unknown in Georgia. "Elevation affects temperature on an average, 1° Fahrenheit for every 300 feet. This alone would make a difference in Georgia of 16°, by reason of relative elevation between the shore level and the highest summit.

"It is also affected by latitude, and there being a difference of about 4½° between the northern and southern limits of the state, the thermometer should show a difference of about 9° in the temperature.

"But latitude, without the aid of elevation, may not always materially affect temperature. There are other natural causes that may antagonize its influence. The difference in the length of the days may increase the summer range in more northern latitudes.

"At New York, for instance, in mid-summer the days are nearly an hour longer than they are at Savannah, and at Quebec, in Canada, nearly one hour and a half longer, and the nights correspondingly shorter; the consequence is, at New York there is one hour longer for the heat to accumulate from the direct rays of the sun, and one hour less time at night for the heat thus accumulated to be carried off by radiation. This is said to be the cause why Northern latitudes are hotter in summer than Southern latitudes.

"Finally, we have no hesitation in saying that, take it the year round, the climate of Georgia is equal to any to be found on the globe, whether we regard personal comfort in indoor and in outdoor work, or for the production of crops for the support of man and beast, both in the summer and the winter months. We may mention a fact in this connection:

"The city of Atlanta is situated within a few miles of the

southern line of what is called northern or upper Georgia, which contains the mountainous region, and yet we know many farmers in the immediate vicinity, who have pastured their stock throughout the past winter, and kept them in excellent condition on the growing crops of wheat, rye and barley." As regards

RAINFALL,

Georgia has an abundant annual supply, generally well distributed through the year.

The following from the Farmers' Scientific Manual, shows that there is no lack of rain for the production of crops for cattle: "The average annual rainfall for five years, from 1871 to 1875, inclusive, at West End, near Atlanta, is found to be 53.32 inches, and at Macon 54.88 inches. From observations through a long series of years, by the Smithsonian Institute, it has been found that the average annual amount of rainfall in the several sections of the State is approximately as follows: "north Georgia fifty inches, middle and east Georgia, the northern part of southwest Georgia and southeast Georgia, 55 inches, the middle portion of southwest Georgia, 60 inches; and the extreme southern part of southwest Georgia, 65 inches;—average for the State about 54 inches.

There is every variety of soil from the sand-bed to the stiffest clay, and every variety of topography from the broad plains in the south, gradually passing into the hill country of middle Georgia, which in turn rises with increasing elevation to the mountains of north Georgia.

Throughout these varied circumstances of soil and climate, cattle thrive and under the careless, neglectful system generally pursued, yield an annual interest upon "the investment, and the annual cost of keeping" of *forty per cent.* according to the reports of those who keep cattle in different parts of the State.

In nearly the whole State, cattle can be fed, in part at least, upon green food every month in the year, if proper attention is given to planting crops for their use.

VEGETATION, NATURAL AND CULTIVATED.

It is hardly necessary to say more under this head than to state that Georgia soil produces all the cereals, grasses and other forage plants, grown in the Northern and Middle States of the Union and some of great value, not grown in those sections, but in order that the capacity of our soil under high culture may be appreciated, a few instances of unusual production will be given, to illustrate the facilities for cheap feeding which our peculiar climate, soil and productions afford.

In 1873, Mr. R. H. Hardaway produced, on upland, in Thomas county, 119 bushels of corn on one acre.

In the same county, the same year, Capt. E. T. Davis produced 96½ bushels of rust-proof oats per acre. After the oats were harvested he planted the same land in cotton and in the fall gathered 800 pounds of seed cotton." From this he got 18 pushels of cotton seed, making in all 114 bushels of excellent stock feed from one acre.

In 1874, Mr. Wiley W. Groover, of Brooks county, produced, with two horses, on a farm of 126½ acres, without the use of commercial fertilizers, cotton, corn, oats, peas, sugar-cane and potatoes, to the value of $3,258.25, of which $2,213.25, were net profit. The stock raised on the farm were not counted in this estimate.

Mr. Joseph Hodges, of Brooks county, produced on one acre 2,700 pounds of seed cotton. From this he got, besides 900 pounds of lint cotton, 60 bushels of seed, which makes excellent stock food.

In Bulloch county, Mr. Samuel Groover produced on one acre, 3,500 pounds of seed cotton, or 1166 pounds of lint and 77 bushels of seed.

Mr. J. R. Respass, of Schley county, gathered in 1878, 500 bushels of oats on five acres of upland.

Mr. H. T. Peeples, of Berrien county, reports to this department 800 bushels of sweet potatoes gathered from one acre of pine upland.

In Wilkes county 123 bushels of corn were gathered from one acre of bottom land.

In the same county Mr. J. F. Madden produced in 1876, 137 bushels of oats on one acre.

Mr. R. M. Brooks, of Pike county, produced in 1873, 500 bushels of rice on five acres of bottom land.

Mr. R. B. Baxter, of Hancock, produced in 1872, 4,862 pounds of dry clover hay, on seven-eighths of an acre of upland at one cutting.

Dr. T. P. Janes, of Greene county, harvested in 1871, five tons of clover hay per acre, in one season, at two cuttings.

Mr. Patrick Long, of Bibb county, after harvesting from an acre a crop of cabbages, cut from the same ground, the same year, 8,646 pounds of native crab-grass hay.

Mr. S. W. Leak, in 1873, harvested 40 bushels of wheat from an acre, sowed the stubble in peas and harvested 10,726 pounds of pea-vine hay in the fall of the same year, from the same acre.

Mr. Edward Camp, of Coweta county, harvested 1,000 bushels of oats from ten acres.

Mr. J. T. Manley, of Spalding county, harvested 115 bushels of oats from one acre.

Mr. L. B. Willis, of Greene county, in June 1873 harvested, from one acre and one third, 20 bushels of wheat, and in October following, harvested from the same acre, 27,130 pounds of corn forage.

Dr. W. Moody, of Greene county, harvested at one cutting from one acre of river bottom, in 1874, 13,953 pounds of Bermuda grass hay.

Mr. J. R. Winters, of Cobb county, produced in 1873, from 1⅛ acres, 6,575 pounds of dry clover hay, at the first cutting of the second year's crop.

Mr. T. H. Moore, of the same county, produced on one acre, 105 bushels of corn, and Mr. Jeremiah Daniel, 125 bushels.

Mr. R. Peters, Jr., of Gordon county, harvested in 1874, from three acres of Lucerne, four years old, fourteen tons and 200 pounds of hay, or 9,400 pounds per acre.

Mr. Thomas Smith, of Cherokee county, produced on one acre, 104 bushels of corn.

In Monroe county in 1879, 137 bushels of oats are reported gathered from one acre, by one farmer, and 56 bushels of wheat by another.

In Oconee county 106 bushels of oats from one acre are reported.

Similar instances of large yield might be given in greater numbers, but enough have been given to show the capacity of the soils of Georgia to produce in the greatest abundance, every variety of food for neat cattle.

Strangers from regions in which grain and stock are the principal market products, are impressed with the absence of sod fields, forgetting that the rearing of stock is a secondary consideration in all that portion of the South where cotton is cultivated as the staple money crop.

Wheat, rye, oats, barley, Indian corn, rice, all the grasses and leguminous plants grown in other parts of the Union, besides others peculiar to the South, the medicks, etc., grow profitably in Georgia.

Bermuda Grass, the bane of cotton fields, but a boon to the stock farm, makes a more impenetrable sod than the famous blue grass, and once well set, will afford pasturage inferior to none in nutritive qualities, for an indefinite period.

Small Grain, sown early in the fall, affords pasturage through the winter months, or may be repeatedly cut and

to cattle during the late fall, winter, and early spring months.

Lucerne, one of the most nutritious plants grown, may be cut from four to six times during one season, and once well set will last for thirty years, and perhaps longer, if properly cared for, Mr. Peters has a few acres in Gordon county, that were planted 24 years ago, from which he harvests several crops every year.

The Field-Pea, peculiarly a Southern forage plant, grows most luxuriantly on ordinary lands, and affords a superior provender for cattle.

The Millets thrive well, though not extensively cultivated, and give heavy yields of forage for soiling or hay for winter. The cat-tail millet has been culivated for half a century in small patches, for feeding green during summer. It can be cut several times during the summer.

Sweet Potatoes, another crop peculiar to the South, yield immense crops per acre when well cultivated on sandy or sandy loam soils, as high as 800 bushels per acre having been reported to this Department.

Forage Corn affords an immense harvest of excellent provender at small cost.

Natural Pasturage is relied upon by the majority of the stock-owners of Georgia, and in many sections of the State it affords an abundant subsistance for cattle during the summer months. Where the river and creek bottoms are inclosed during the summer the grass and wild cane, which grows upon them, afford good winter pasturage for cattle. Where such are accessible in middle and southern Georgia dry cattle often pass the winter in good condition, without being fed at all.

Indeed the only difficulty in the way of profitable cattle-raising in Georgia, rests with the people, rather than with the climate and resources of the State. The climate is milder in winter, and not warmer in summer than that of those sections of the Union in which cattle are reared in

the largest number, and of the best quality. Expensive barns are not needed, and less provision is necessary, as regards food, to carry cattle through the winter.

The attention of the people has not been specially directed to stock-raising, and consequently the capacity of the State for cattle production has not been properly tested. the rearing of cattle has been merely incidental to other industries of the farm, which have been considered more important and profitable.

Again, the demand for the products of the pasture and the dairy has not been such as to stimulate attention to cattle, or justify farmers in making special investment of money with a view to production for market.

There can be no question as to the profit of better attention to cattle in Georgia, even if a domestic supply of beef, milk and butter, is the only object, but with the present means of transportation, our mild winter climate may be made available in supplying Northern markets with fresh yellow butter, made from fresh, green food.

The cattle of Georgia have enjoyed a most remarkable immunity from disease of every kind, an occasional case of red water being the only serious malady with which they are affected.

CHAPTER VI.

THE BEST BREED FOR GEORGIA.

This question cannot be answered definitely for the whole State, or for two farms, even, in the same neighborhood, without taking into consideration the circumstances of soil, probable attention to be bestowed, and the object had in view by the breeder. The best breed for any particular locality is that which under all the circumstances

will pay the owner the highest profit on the investment in money and labor.

There are so many factors to be considered in answering this inquiry, so often made, that the subject will be discussed from the various standpoints of farmers of Georgia surrounded by different circumstances of soil, climate, proximity to markets, etc.

No farm is complete without its milch cows. The question, therefore, is not whether cattle shall be kept on the farm, but what kind will pay best, and how much attention should be bestowed upon them. The first question to be considered is the use to be made of cattle, whether they are to be bred for beef or for the dairy, and if for the dairy, whether the produce is to be consumed in the form of milk or butter.

If milk is the object of the proprietor, and especial attention is to be given to providing suitable and abundant food, and proper care bestowed upon the cattle themselves, with a view to their improvement, a thorough bred bull of one of the milk breeds should be crossed upon well selected native cows, and upon their female offspring for several generations. Some will object to this plan of breeding the bull to his own offspring, but if they will read the history of some of the most noted herds of this country and England, their prejudices in this regard will be weakened if not removed. This, however, will be more fully discussed in the chapter on "The Principles of Breeding." Of course each individual must make his choice of breed to suit his soil, climate, pasturage, and the uses which he proposes to make of them.

If he proposes to raise thoroughbreds for sale, then the selection should be made of that breed which is most popular and hence will meet with the most ready sale. At present the Jerseys are the most popular and fashionable in Georgia.

The Ayrshire, Dutch, and Short Horn (of milking strain) make the best sources from which to cross the native cows, where large yield of milk is the object; the Ayrshire for any part of the State where a reasonable supply of provender is accessible; the Dutch or Short Horn where an abundant pasturage can be had.

The latter, being large animals, require a liberal bite of grass or abundant feeding to give good results.

The Devons and their grades answer a good purpose where a combination of beef, milk and butter is the object of the breeder.

If the sale of butter is the principal object, the Jerseys and their grades are unquestionably the most profitable. The thoroughbreds of all the breeds are too expensive to be used purely for farm purposes where the sale of their products, other than thoroughbred offspring, is relied upon for the income. When the sale of thoroughbreds, however, is the principal object, the sale of dairy products proves a material auxiliary in defraying expenses.

If little attention is to be given the cattle, and no special provision made for their support, good native cattle will probably prove more profitable than improved breeds, and may themselves be greatly improved by continual judicious selection.

If good attention, however, is to be bestowed upon the cattle and liberal provision made for their support, a cross of a thoroughbred bull of the breed suited to the surroundings and objects of the breeder, will materially improve the character of the offspring and increase the profits derived from the sale of their products.

Pertinacity in breeding is often more important than the first selection of a breed, if the farmer has a clear conception of what he needs and will practice an intelligent and judicious selection of breeding animals. It is too often the case that breeders cross their stock with such different breeds

as happen to be most convenient, regardless of the character of cattle they need, until the type of the offspring becomes as uncertain as a lottery, and their qualities as various as the sources from which they were derived. If an intelligent breeder will determine definitely the character of stock he needs, and select the offspring of each generation with reference to the use he intends to make of them, never using other than thoroughbred bulls, he can in a few years build up a herd equal, for farm or dairy purposes, to the thoroughbreds, and much less expensive.

If beef production is the leading object in view, two questions must be carefully considered in the outset, viz.: Can sufficient pasturage be provided for rearing the young cattle and fattening the beeves in summer, and enough grain and forage stored away each summer and fall to carry the young cattle through the winter in good condition, or stall-feed the beeves if the markets demand winter or spring beef.

The difference in the price of beef in winter and in summer will often justify the expense and trouble of fattening the animals on grain in the winter or early spring. Whether this will pay or not must be decided by each farmer for himself. But little of this has thus far been done in the South.

If abundant pasturage can be had for summer and forage for winter, the next question to be considered is, whether the grazier shall rear his own cattle or purchase them in a lean condition and fatten them on grain or grass, according to the circumstances which surround him. Graziers rarely rear all of their cattle on account of the necessit of keeping a large number of cows and young cattle constantly on hand in order to supply the desired number of beeves annually.

CHAPTER VII.

GENERAL PRINCIPLES OF BREEDING.

On this subject there is much difference of opinion among experienced breeders, especially as to the propriety of what is usually called in-and-in breeding. The following general principles are extracted from "American Cattle," by Allen, who is probably the best authority on the subject in hand on this continent. He gives the following rules for the guidance of beginners in the selection of a herd to start with. They should have—

1st. "Sound health, and freedom from constitutional, hereditary, chronic or local disease, blemish, or infirmity of any kind. And such sound health and freedom from any kind of *fixed* disease, should appertain to every young animal which is to be retained for breeding purposes thereafter.

2d. "As much perfection of form as may be possible to obtain in the breed, bearing in mind the chief uses for which the animals are intended.

3d. "That they possess the strong and marked characteristics of their breed, in the various points belonging to it.

4th. "That if of a distinct breed, the blood be thoroughly pure, and that purity be substantiated by well authenticated pedigrees, through as many generations back as can be ascertained.

5th. "Good temper, and a kindly, docile disposition in the animals so selected or reared for breeding or other purposes.

"To carry out these rules, an enumeration of certain points which all cattle, of any breed should possess, is necessary; among them are:

1st. "A fine head, small and clean.

2d. "A broad, full and deep chest, giving room for well developed and vigorous lungs to play.

3d. "Good length, breadth and soundness of body, roomy and full from shoulder to hip, with low flanks, thus giving room for abundant action of the viscera, or bowels, and expansion of the fœtus, if a female.

4th. "Straight back, broad hips, and good length of loin.

5th. "Fineness of bone, and smoothness in the carcass generally."

These general, and we may say universal, requisites, are to be considered no matter what breed is adopted, or what use is to be made of the cattle, bearing in mind, however, the peculiar points and characteristics of the particular breed adopted.

"To the rules, and their subdivisions, here laid down, relating to the general figure of the animal, are to be added certain requisites to be supplied by the breeder, and of these may be named as indispensible:

1st. "Abundance of proper food in the various seasons, as grass, or its equivalent, in spring, summer and autumn; nutritious, well-cured and prepared food in winter; and plenty of good water *always*.

2d. "Regularity in feeding; no over-stuffing; no scantiness of allowance; but enough always without waste.

3d. "Shelter always when needed, according to temperature of climate and atmosphere; avoiding extreme cold, violent storms and excessive heats.

4th. "Kindly treatment; thus promoting docility in the animal; contentment of disposition, and a fearless confidence in its keeper—all promotive of quietude and thrift. Dumb beasts though they be, they appreciate good treatment much beyond what is usually supposed, and all these are indispensable to the successful efforts for the improvement or even retention of their good qualities."

The cattle-breeder must study nature, learn her laws, and direct his efforts at improvement in accordance with them, if he would attain success. Of these laws, none is more inexorable in its demands for consideration at the hands of the stock-breeder, or more potent in deciding the question of success or failure, than that which pervades all animated nature, animal as well as vegetable, viz.: "Like begets like." Without this, Agriculture in all its various departments, would be a deception and a snare, and all nature perpetually continue in a chaotic state. With this principle, however, as a guide, the stock-breeder need only exercise a sound judgment, guided by a close and careful observation to effect the most marked improvement in the character and type of his stock.

Whether the influence of this principle enures to the benefit or injury of the herd will depend upon the skill of the breeder in selecting and mating his breeding animals, so that good rather than bad qualities shall have prominence in the offspring.

Each breeder must decide upon the object to be attained in breeding cattle, select the breed that suits his purposes, and adhere to fixed principles in improving and developing the most profitable stock for his purposes.

If his object be to sell thoroughbreds, he must make a selection of the breed or breeds that will command the most ready sale and best suit the wants of his prospective customers, for if they do not suit the wants of his patrons, however fashionable they may be, his success will be temporary, and another who better understands the wants of the people will take his place.

In order to succeed in rearing thoroughbreds, the breeder must make judicious purchase of *registered* animals with good ancestral records, both as to pedigree and profitable yield of the peculiar product for which they are bred.

A proper nucleus being obtained, good attention, care-

ful selection and abundant food, will be necessary to success. The breeder must thoroughly acquaint himself with the general points of a good animal and especially with the type of the breed he keeps.

If his object be the sale of beef, his selections must be made for breeding purposes, of those animals which experience has taught are best adapted to his purpose, and provision must be made for an abundant supply of food for the rapid and full development of his animals.

The beef-producing breeds require full pastures or liberal feeding, without which success need not be expected.

When beef is the object, those animals must be selected for breeding purposes which promise the largest development of the most salable parts, combined with early maturity and capacity for liberal feeding.

If milk or butter is the object, selections for breeding purposes, must be made of one of those breeds which is noted for large yield of those products; and young animals which give promise of development into the dairy type, must be selected for propagating their species. Selection, however, must be made with good judgment, in order that good qualities may be not only propagated but increased in the offspring. The natural tendency of improved stock to retrograde, necessitates constant watchfulness on the part of breeders to counteract this tendency, by selecting for breeders those bulls and heifers which both by their ancestral record, and by their own points, promise to propagate good qualities in their offspring. It must be remembered that, in their natural state, cows give only enough milk to sustain their young for a few months, and that the present excess of yield over the wants of the calf, is the result of domestication, cultivation and selection. Turn them out to breed promiscuously among themselves, cease to stimulate milk production by abundant pastures, liberal feeding, and thorough milking, and deterioration com-

mences at once, and will continue until the original normal condition is reached. This is illustrated in the cattle on the range in southern Georgia where they are never milked. The yield of milk is only sufficient to sustain the calf, and with the exception of where improved bulls are occasionally introduced, the quality of the stock deteriorates into very inferior animals, small, slow to mature, homely and unprofitable. Yet these cattle may be steadily and surely improved by continued selection and good attention. This fact is shown by the good qualities of some of the cows which receive good attention from their calfhood. The breeder who gives the best

ATTENTION TO CALVES

will usually be most successful in building up his herd and maintaining it in an improved condition. Animals that are stunted in their growth when young, rarely recover entirely from its effects, no matter what be the subsequent care bestowed upon them. They should be kept in a growing condition from their birth, and not at any time, winter nor summer, stinted in food.

Their future usefulness and profit will depend in a large measure upon their treatment during calfhood.

IMPROVED BULLS.

The fact that "like produces like" is most forcibly illustrated in the use of thoroughbred bulls upon our native cows. The thoroughbred having a fixed, positive type and the power, from long breeding in a line, of transmitting his qualities to his offspring, and the female being destitute of any fixed power in this direction, the prepotency of the bull in such cases is most marked, and the improvement in a herd of native cows by the use of thoroughbred bulls is rapid and satisfactory. Indeed the half-bloods often equal in appearance and utility the thoroughbreds, but

breeders should not be induced by their fine appearance to rely upon them either for the improvement of their herds, or for sustaining improvements already made by the use of thoroughbreds.

The type of the sire, while showing prominently in the half-breeds, is not sufficiently fixed in them to enable them to transmit their good qualities with any degree of certainty. Grade males, therefore, should not be used when it is practicable to secure thoroughbreds. If, however, thoroughbreds can not be obtained, the next best that can be done is to use the best grade male that can be had.

Small males should be coupled with large females when crosses of different breeds are made. If the Jerseys or their grades are crossed with Short-Horns or their grades, the Jersey males should be used on the female Short Horn, and so with other breeds of different sizes; the males of the smaller on the females of the larger.

If large males are bred to small females, the drain upon the system of the small female to sustain the fœtus, which will naturally partake of the size of the sire, will severely tax her digestive organs. Again, the capacity of the womb of the small female will not afford sufficient room for the full development of the large fœtus, and deformity may result.

If such fœtus is carried to maturity in small dams, the risk of death of the dam or calf, or of both, is imminent. In one herd, in which grade Ayrshire cows were crossed with a Short Horn bull, five cows died during parturition, and the calves had to be taken from others.

When small males are crossed upon large females, none of these difficulties are experienced.

The large feeding capacity of the dam, enables her to sustain, without extraordinary tax, the small fœtus, she has ample uteral capacity for its full development, and no difficulty is experienced in its delivery.

PAMPERING OBJECTIONABLE.

While breeding animals should be kept in a thrifty condition from calfhood, extraordinary feeding or pampering is for many reasons objectionable. The tendency of overfeeding, is to induce constitutional weakness rather than vigor, and if carried to excess, often produces disease, especially if not continually and uniformly practiced when once begun.

It is especially objectionable in milking breeds, since the tendency to fat-production may be developed at the expense of milk-production.

The temptation to over-feed even breeding stock, when intended for sale, is almost irresistable, and may not be very objectionable in those intended exclusively for beef-production, if the young cattle receive similar treatment at the hands of purchasers. In the case of beef-breeds, the high feeding would probably have the tendency to develop the beef-producing capacity of the breed. Liberal feeding has been practiced by many of the most celebrated breeders, from Bakewell down to the present day, but pampering is seldom practiced by skillful breeders. Observation teaches that heifers and cows which are over-fed are not only less certain to breed than those kept in a good,thrifty condition, but that the calves from over-fatted dams, are smaller and less fully developed than from those in only good condition.

The opposite extreme however, is even more objectionable. Cows should be in good condition when they bear calves. If they are very poor at parturition, they will neither bring good calves nor afford a profitable yield of milk.

CROSS BREEDING,

Or the coupling of two thoroughbreds of different, distinct breeds seldom gives satisfactory results, since both sides

having the power of transmitting accurately their peculiar type, or both being positive in character, the type of neither parent is correctly represented in the offspring, but an uncertain blending of the two. The first cross sometimes gives good animals, but deterioration is rapid thereafter. It is generally better to cross thoroughbred bulls upon good common cows, and then if a mingling of pure blood is desired, make a second cross of the desired blood upon the grades resulting from the first cross.

Thoroughbred heifers of great value, should be bred from the first to bulls of the same breed, since the first male with whom they have connection *may* materially affect the character of their offspring, by other bulls. There are very striking instances of this influence on record, of which a few will be mentioned.

Alexander Harvey, physician and lecturer in the Royal Infirmary, at Aberdeen, Scotland, in a pamphlet "On a Remarkable Effect of Cross-Breeding," gives some striking illustrations of this fact from which only two will be given. "A pure Aberdeenshire heifer, was served with a pure Teeswater bull, by which she had a first-cross calf. The following season the same cow was served with a pure Aberdeenshire bull; the produce was a *cross* calf, which, when two years old, had very long horns, the parents being both polled. Again, a pure Aberdeenshire cow was served in 1845, with a cross bull, that is to say, an animal produced between a first-cross cow and a pure Teeswater bull. To this bull she had a cross calf. Next season she was served with a pure Aberdeenshire bull; the produce was quite a cross in shape and color." The same author mentions similar instances which occurred with mares, sows, dogs, pigs and sheep. These facts are mentioned in order that the owners of thoroughbred heifers of great value, from which they wish to breed thoroughbred animals of their kind, may avoid similar mistakes.

IN-AND-IN BREEDING.

On this subject Allen says: "This mode of breeding, to obtain certain results, has been practiced with all domestic animals—among quadrupeds, from the horse down to the rabbit—and with the feathered tribes, through all their varieties, from the swan to the canary bird. Such is the fact; and in support of it, numerous instances might be named, in breeding other animals than cattle, which are not now necessary to notice as we state the principle on which the practice has been adopted, and the successful results which have followed it."

The most noted breeders in this country and Europe have practiced close in-and-in breeding with the most satisfactory results, only going out of their own herds at long intervals for bulls. Allen says; "Bakewell did so with his Long Horns, through his whole course of cattle breeding, going only twice out of his own herd for a fresh bull, and then into the same family blood, at the distance of a few counties away, and no breeder of his time had better, if as good, cattle of the kind as he. Price, a noted breeder of Herefords, thirty years ago—no better in England—asserted that he had not gone out out of his own herd for a bull for forty years, and at his final sale, when he gave up breeding, his cattle brought the highest prices—for Herefords—that had been known. The two brothers Colling, began breeding Short Horns, from the best cattle they could obtain from other breeders, about the year 1780. They soon got the bull Hubback, a thoroughbred of their own breed, and although they retained him only three years, they bred pertinaciously from his blood until the year 1810—thirty years—excepting only in Charles Colling's "alloy" family of the Galloway cross. Charles, in that year, sold out his stock at the highest prices ever known. His brother Robert so bred his stock—no "alloy" about them—until 1818—thirty-eight years—when he sold out

at prices larger than any other Short Horn herd would sell for at the time. * * *

"Their stock stood in the very highest repute, and no, men had bred so intensely in-and-in, by every possible intermixture, as they, adhering to their old blood to the last: Charles, in some instances, bred his bull "Favorite," to his own dam, and sister, and granddaughters, and so down for four or five generations.

"So also bred Mr. Bates, who bought his first "Duchess" deeply bred in-and-in, of Charles Colling, in the year 1804. He bred her and her near relations together, all closely allied in blood, and never went out of his own herd for a bull, with any success, as he frequently asserted, until the year 1831, when he obtained the bull "Belvedere," of the same blood, in another herd. He also introduced into his herd, the "Matchem cow," an animal showing excellent points of character, a stranger to his own stock, but which he contended had a back-cross of his favorite blood in her, and thus possessing good quality, with which to reinvigorate the energies of his deeply in-and-in bred stock. He crossed his best bulls on that cow, and then interbred her produce with others of his old blood, and adhered to that blood thus crossed, and still further interbred, for the remainder of his life. Mr. Bates died in 1849, and for more than fifty years, was a Short Horn breeder.

"So, also, bred the Booth brothers, John and Richard, long time breeders of great celebrity, and their stock still remains in high repute, both in England and America. They bred deeply in-and-in. So did the Wetherells, Mason, Wright, Trotter, Charge, Earl Spencer, Sir Charles Knightley, and other noted breeders of their day, although we know less of their particular breeding, only as we trace them through the early herd-books, than of the Collings and Bates. All these herds were of high reputation, and their blood, passing since through the hands of other

breeders, is now widely, by importation, scattered over the United States, and the Canadas. * * Every *improved* race of cattle in Britain has been more or less so in-and in-bred, Devons, Herefords, Long Horns, Ayrshires, Highlanders, Galloways, Alderneys, and the famous 'Dutch' cows of Holland. It was indispensible so to do, to concentrate their good qualities, until a standard of excellence had been attained, from which the breeders could strike out into more divergent blood."

"Thus; the fact that in-and-in breeding, of itself, having a tendency to deteriorate the quality of the produce, is shown to be fallacious, so far as *those* breeders were concerned; the *manner* of doing so is quite another thing. Interbreeding in such close relation, is a nice—possibly a hazardous—thing, and can only be practiced by experienced men who are good physiologists, have a just appreciation of both the good and indifferent qualities which their cattle possess, and the knowledge *how* to couple them together, to produce favorable results. The great merits and object claimed for in-and-in breeding, is the *concentration* of good blood in the animal so bred, enabling him or her to transmit that blood strongly, not only in the herd where they originated, but in other herds to which they may be removed. We do not, in fact, believe that many who object to the so-called in-and-in practice of breeding, really appreciate their own course of practice, while they are constantly pursuing that which they condemn."

Those who practice in-and-in breeding, should bear constantly in mind the fact that while it is the most expeditious method of intensifying good points, bad qualities are also propagated and intensified by the same practice, and hence, unless the utmost care is exercised in the selection of animals near of kin to be coupled together, constitutional defects will be intensified to the serious injury of the herd.

It must be remembered, also, that bad qualities, thus intensified, are not easily removed by subsequent breeding.

To illustrate: If a male and female of very close kin, each having the same defect, are coupled together, the tendency of both being to transmit this particular quality, it will be materially increased in the produce.

If the defect is an external one, which may be readily seen, it may be avoided in the selection of animals to be coupled, but if the defect is in the heart or lungs, such organic defects may be seriously intensified before they are discovered.

Once established by such breeding, it is no easy matter to ever eradicate them, even with the most careful selection, made by the best and most experienced judge of cattle.

Hence, while in-and-in breeding is perhaps the surest means of rapidly improving a given herd under careful selection by an experienced breeder, it is by no means a safe, but is even a hazardous, practice for beginners, or the inexperienced.

The principles to be observed in breeding under any other circumstances, apply to in-and-in breeding, but their application in the latter case requires more accurate knowledge of the subject, and much greater skill in selecting breeding animals.

If it is desired to propagate any particular good quality, the male and female to be coupled should possess this quality well developed, and if it is desired to rapidly intensify it in the produce, animals closely related and possessing the desired quality should be selected. Care, however, should be used to avoid, in such selection, animals having bad qualities highly developed, since the principle that "like begets like" applies as well to the transmission of bad as of good qualities.

The first thing to be considered in the selection of breeding animals is soundness of constitution, without which no animal, whether male or female, should be allowed to propagate its kind. The next in importance is the form

and peculiar points characteristic of the particular breed in use.

In ordinary breeding, it is of great importance that the animals selected for breeding purposes shall have good qualities well developed, and be as free as possible from defects. This is important in the females as they exert probably an equal influence with the male upon their individual offspring; but the character of the bull is of greater importance than that of the cow in proportion to the number of cows served by him. To illustrate: A cow can affect the character of only one calf a year, while a bull may stamp his characteristics upon an hundred in a single year, if his resources are properly husbanded and judiciously directed. One perfect service by a vigorous bull is as effectual as a dozen and often more so.

Now if the bull has any organic defect he is liable to transmit it to each one of his produce, and if subsequently coupled with his own offspring, the defect will be intensified by transmission from both dam and sire. The necessity for the utmost care in the selection of the bull when in-and-in breeding is practiced will, therefore, be readily understood.

The prejudice which exists in the minds of many persons against what they call incestuous breeding, is based largely upon their preconceived ideas in regard to the intermarriage of close blood relations in our own species. There is little analogy, however, in this regard between man and other animals. There is no such thing as incest in the brute creation. "They have no *family* affections or sympathies, no permanent likes or dislikes, after the mother has weaned her young, and it has become able to provide for itself. The female, when in heat, freely receives the male, comely or uncomely, no matter what, if of her own kind; and the male, with the same ungovernable propensity, seeks his gratification with her. Blood relation

among themselves amounts to nothing, even if they had the capacity to *think* of it, which they have not. The indulgence of their lust is the sole object of their desire, and that is effected regardless of consequences."

The conclusions, therefore, are:

1. There is nothing wrong or improper in in-and-in breeding among stock.

2. It is a dangerous practice except in the hands of experienced and skillful breeders.

3. It has been in such hands a most potent agency in building up the best breeds of cattle now known.

4. It is the most expeditious method of establishing in any given breed a desired type, under judicious selection of breeding animals.

5. Promiscuous in-and-in breeding, without the most careful and skillful selection of both sire and dam, will result in degeneration both in form and constitution.

CHAPTER VIII.

GRADING UP NATIVES.

Before discussing the subject it is important to understand exactly what is meant by the term "native."

In the ordinary meaning of the term there are of course no native cattle in America, since, previous to its discovery by the Caucasian race, there were no cattle on this continent.

All cattle which not only do not belong to any distinct breed, but cannot be traced to any such breed, are classed, by way of distinction, as "natives." Thus understood, there is no impropriety in the use of the term "native" to designate the common cattle of the country. They con-

stitute a large majority of the cattle of this country, and among them we often find individual specimens of marked excellence.

They must form the basis of improvement in our herds, whether that improvement be made by the slow process of selecting the best specimens of the natives, male and female, for breeding purposes, or whether pure-bred bulls be used upon native cows.

The natives, having no fixed hereditary type, cannot be relied upon to perpetuate their good qualities in their offspring, but having strong constitutions, the native cows afford an admirable basis upon which to build, by the use of thoroughbred bulls of those breeds which are suited to our climate and pasturage.

The farmer who proposes to grade up his stock, should first consider well which one of the pure breeds will best suit his purposes, and, after once making his selection, adhere to that particular breed, using only thoroughbred bulls on both native and grade cows. There are cases in which it is advantageous to cross the grades with a new breed to accomplish a particular end, as, for instance, the cross of a Jersey bull upon grade Ayrshire or Short Horn cows, that are very deep milkers, with a view to an increase in the production of butter; but, as a general rule, it is better to adhere to one breed and grade up to a high standard, combining the constitution of the native with the hereditary good qualities of the pure breed.

The thoroughbred to be employed will depend of course upon the use that is to be made of the cattle. This each breeder must determine according to his surroundings and proximity to market. In any event, however, he must determine to give good attention to his stock, since the use of thoroughbred bulls alone, without abundant food and good attention, will not secure the full benefit of the cross.

Good attention and abundant food are indispensable requisites to improvement in stock, and not only this, for without them *deterioration is inevitable.*

With the exception of those sections in which cattle are turned out on the "range," the production of milk and butter is the leading object of the owners of cattle in Georgia, and hence in the selection of bulls with which to grade up the natives, choice will generally be made from either the Jersey or Ayrshire—the former if the sale of *butter* is the object, and especial care is to be taken with the stock; the latter if *quantity* of milk is the object, and reasonable care given.

The Short Horn of *milking strain* will meet the latter requirements, in those sections of the State where the grasses are cultivated and abundant pasturage is available, but are not suited to Georgia generally, at present, on account of deficient pasturage. The Short Horns require on account of their size, more liberal feeding than the smaller breeds.

If combination animals are sought the Devon cross will probably give satisfactory results.

Whether resort is had to pure breeds or not, heifers for breeding purposes should be selected with reference to future usefulness for the purpose for which they are bred. If intended for milch cows, then those having the characteristic form and other marks indicative of future usefulness at the pail should be selected. If intended for beef, or for rearing beef animals, then those giving promise of the greater development of flesh at the least cost are to be selected. There is generally too little attention paid to the selection of breeding animals with direct reference to the use to be made of them.

CHAPTER IX.

MANAGEMENT OF CALVES—SELECTION OF HEIFERS AND BULLS.

Every true breeder appreciates the importance of proper attention to calves, and the influence of early treatment upon their future usefulness; unfortunately, however, calves receive but little attention at the hands of the majority of our farmers, and too often become seriously stunted in their growth by neglectful treatment and insufficient food while they are young, preventing full development and usefulness, whether they are intended to supply the dairy or the shambles.

Few exercise any control over the time at which their cows drop their calves, allowing the bull constant companionship with the cows, and consequently having them coming in at all seasons of the year, regardless of their own convenience and profit, or the usefulness of the cow or the offspring.

There are various considerations which should control the owner of cattle in determining the time at which his calves should be dropped, the chief among which is the use to be made of both dam and calf.

If the rearing of stock for beef or sale as thoroughbreds or for the dairy is the object chiefly had in view, the spring is, beyond question, the best time, under ordinary circumstances, to have calves dropped, for the following obvious reasons:

1. If they are dropped in spring after the grass has put forth, the cows, having succulent green food, afford an abundant supply of milk to give the calves a good start-off, and as soon as old enough, they have the advantage of

tender pasturage—natural food, upon which they will continue to thrive, and be in good condition to withstand the winter. The cows being in a healthy, thriving condition will naturally impart health and thrift to their offspring. It is important, however, that the cows be kept in good condition during the winter preceding their parturition, that the fœtus may be fully developed. If cows are allowed to become very poor during winter, as is too often the case on our farms, the fœtus will be dwarfed and enfeebled by the defective nutrition derived from the dam.

2. The cost of keeping both cow and calf will be less when both have the run of pastures, than if required to be fed, as they would be if the calves are dropped in the fall. If dropped in summer, the calves go into winter quarters so young that their growth will receive a serious check during the winter, unless more care is given them than is usually bestowed in Georgia.

A young animal never entirely recovers from the effects of such severe check to its growth as calves usually receive from neglect and insufficient food during winter.

Good shelters and abundant food are, even in our mild winters, necessary for young calves, to prevent serious and irreparable injury resulting from a check in their growth, from the want of these.

Green food, in the form of pastures of rye, barley, or oats, should invariably be supplied for calves passing their first winter. This may be done in any part of Georgia by sowing the small grain early in the fall. Dry food, however sweet, will not answer so well for them as green pastures.

REARING BY HAND.

Since this method requires much care and personal attention, it is not likely to be adopted generally in Georgia, but for the benefit of those who are willing to take the necessary trouble, detailed instructions are given em-

bracing the practice of the best and most successful breeders. The most approved plan is to allow the calf to fill itself once by sucking its mother, and then remove it, if possible, so far from its dam that she cannot hear its bleatings. When it has become quite hungry, teach it to drink the warm milk, freshly drawn from its mother, as follows: Back the calf into a corner, place its head between the knees with a pail of warm milk in front. Moisten the finger in the warm milk and induce the calf to suck it, pressing the head down at the same time and immersing the finger in the milk. The calf continuing to suck will draw the milk from the pail, and if the finger is gradually withdrawn, will learn to drink. This done, no further trouble will be experienced.

Mr. Frank White, an eminently practical and successful farmer, of Hancock county, Georgia, wrote in the May number of *Southern Enterprise*,, 1879, as follows:

"*Management of the Calves.*—When the calves are dropped I let them remain with their mothers until dry, and allow them to fill themselves once with milk. Then I remove them from the cow, so that they can neither see nor hear each other. In about twelve hours, or as soon as the calf gets hungry, I have the cow milked and carry the warm milk to the calf. First get it to draw the finger, and, while doing so, hold the finger in the milk, or for the first time feed with a spoon as he draws the finger.

"It only requires a day or two to teach them to drink from the bucket. I feed them their mother's milk for five or six days, and then give them skimmed milk, that is not sour, prepared as follows: Take a tablespoonful of sifted meal and pour over one quart of boiling water, and add sweet skimmed milk until the mixture is milk-warm. I feed this for four or five weeks, and then give sour milk or clabber, but always scalding the meal with boiling water, adding more meal as the calf gets older.

"I have never lost a calf under this treatment, and raise them much finer than by the old method of letting them suck their mothers. Besides, they all soon become pets, and run for the boy who feeds them whenever they see him with a bucket in his hand. It is better also for the cows. They give more milk, which is all saved for use, and they are more quiet and much less trouble to manage. The calves too, being handled while young, make gentle, good cows.

"When the calves are weaned from the bucket the precaution must be used to have either good, tender grass to turn them on, or have green, succulent food to give them, that they may not be checked in their growth."

The advantages of this method of rearing calves, if proper attention is given them, are very great, and the trouble is no more than that accompanying the old plan of allowing them to suck their mothers, while both the calves and the mothers do better under the former plan.

Apart from the relief from the annoyance of having the calf to nurse its mother at each milking, the increased yield of milk for dairy purposes is ample compensation for the trouble and expense of feeding the calf.

Besides, heifers raised by hand make better milkers on account of the docility acquired by being handled while young. All who have had much experience with milch cows, appreciate the importance of having them gentle when they come to the pail. There is no other plan by which this can be more surely accomplished than by rearing by hand or from the pail.

In a large part of Georgia, especially in the wire-grass and mountain region, this plan is, of course, impracticable, since there the calves run with their mothers on the range, where they are seldom even seen by their owners, and the calves allowed to take all the milk.

If proper provision is made for wintering the cows and

calves; if good warm shelters are provided, sufficient to protect them from cold rains and winds, and a liberal area sown in small grain to supply green pastures, or green cut-food, during the late fall, winter, and early spring, taking the mildness of our climate into consideration, calves dropped in the fall may be made to do quite as well as those dropped in the spring. This, however, will necessitate better provision for them and more attention than is generally made or bestowed in Georgia.

If, however, farmers will provide suitable shelter and abundant winter pastures, so that the calves may go upon grass in the spring in good thrifty condition, there is no reason why a large proportion of the calves may not be dropped in the fall.

Besides this, the price of dairy products being higher in winter than summer, if pastures are provided for the cows also, the annual profits of the dairy may be materially increased by having the most of the cows come in during the fall. This branch of the subject will be more fully discussed in the chapter on the Dairy.

SELECTING BULL CALVES.

When the fact that the bull impresses his peculiar characteristics upon such a large number of calves, is considered, the importance of selecting the best specimens for the purpose of propagating their kind, will be appreciated.

While not even the most experienced and practiced eye can foresee what will be the development of any particular calf, some idea may be formed, however, of the character of the future bull from that of the calf.

The selection should be controlled by the use to be made of the offspring of the animal.

If the bull is to be used in a dairy herd, selection should be made of a calf from a line of cows having a good milk record. It will not be enough that his immediate dam

shall have been remarkable for milk production, since that may have been accidental; but it must have been a fixed characteristic of his female ancestry, and he will be the more certain to give satisfaction if his sire was noted for getting good dairy stock. The calf himself should not have the heavy points peculiar to his sex too prominently developed, but should have evidences of a strong constitution and good digestive organs.

After the selection is made, such attention should be given as will insure continuous thrifty growth without over-feeding or pampering.

If beef-production is the leading object had in view, a different type of calf should be selected, giving promise of greater size, more muscular development, and a greater tendency to take on flesh. Constitutional vigor is a necessary requisite in any animal selected for the purpose of propagating its species, no matter to what use its offspring are to be devoted.

As has been already remarked, selection may improve the common cattle, but there is no certainty of the transmission of their good qualities. Without selection, any herd, no matter how carefully it has been bred in the past, will rapidly deteriorate.

CHAPTER X.

MANAGEMENT OF MILCH COWS—THE RELATION OF THE COW TO CIVILIZATION.

Like the Irish cottager's pig, the cow is almost a member of the family, so close is her relation to their daily support, and her usefulness will be proportionate to the care, kindness, and intelligent attention bestowed upon her. There is no other animal which contributes in so

many and in such important respects to the comfort and happiness of man. Cattle contribute in more ways to production, consumption, and manufactures than any other domestic animal.

Oxen contribute their labor to man's assistance, and when too old to serve in this capacity, they are still as valuable as ever, if made fat, to contribute their flesh for food, and other products to manufactures. Cattle contribute to man's use beef, butter, cheese, milk in various forms, and tallow; their hides, converted into leather, shoe the human race, their horns are largely used in manufactures, and with the hoofs furnish an inferior source of nitrogen; their bones furnish to commerce phosphoric acid and nitrogen; the dried blood from the slaughter-houses furnishes an important source of nitrogen to the manufacturers of commercial fertilizers; their hair is used in the manufacture of some coarse fabrics and by plasterers to increase the cohesive power of their mortar. Every farmer fully appreciates the value of their manure; indeed, in some of the countries of Europe the graziers and feeders of beef cattle consider the manure from their fat cattle a reasonable compensation for the expense and trouble of feeding. Much of the gelatine of commerce is made from the hides and feet of cattle, and especially from those of calves.

It will be seen, therefore, that no other animal yields so many or such valuable contributions to the necessities and comforts of the human family.

This being true, it is not unreasonable to demand for cattle generally such care and attention as will increase their power of contributing to man's wants. Such care, though prompted by the plainest dictates of self-interest, is seldom bestowed by the Southern farmer. It is even rare that the

MILCH COW

receives such attention as to secure her maximum usefulness, notwithstanding the fact that she reminds her owner

of her wants, as well as of her usefulness, by her daily contributions to his table.

If this chapter shall induce the owners of cows in Georgia to bestow better attention upon these useful animals, its object will have been accomplished; the farmers of the State will enjoy increased comfort, pleasure, and profit, the Commonwealth will have better and happier citizens, and will receive, through increased revenue from the enhanced value of live stock, more than enough annually to pay the cost of this Manual. There are about 300,000 milch cows in Georgia. By judicious selection, good feeding, and proper care, an average increase of one quart in the daily yield of milk per cow may be effected beyond all question, and, in many instances, an increase of four quarts will result. An increase, however, of one quart per day for four months would be 120 quarts per cow per annum, or 30 gallons per cow each year. For the 300,000 cows, this would give an increase of 9,000,000 gallons, which at an average price of ten cents per gallon (it retails in Atlanta at 40 cents per gallon) would give an aggregate increase in the value of the milk product of the State of $900,000.00 a year, or $3.00 per cow.

There are in the State about 500,000 cattle, other than milch cows, whose value would be increased by better care, at a very low estimate, $1.00 per head, or in the aggregate $500,000. These are low estimates, easily realized, and yet they figure up for the State nearly a million and a-half dollars. It is safe to say that with proper care the additional manure saved would be worth to the State $100,000.

Every one, who has observed such matters at all, has noticed the superiority of the cows about the villages and cities over those of the country, owing mainly to the better attention given them.

The same difference is seen in the country on adjacent farms with equal facilities for rearing stock, the difference

in results and profits being entirely due to better attention on one than on the other, to selection, food, shelter, and general care of the cows.

The questions of breed and breeding having been discussed in other chapters, they will be introduced here only so far as may be necessary to elucidate the subject in hand. The discussion, too, will be applicable only to such cows as are bred and kept for their milk, and not to those that are kept solely for the purpose of rearing calves, as is the case "on the range" in Southern Georgia.

ON THE SELECTION AND MANAGEMENT OF HEIFER CALVES

Will depend, in a considerable degree, the success with dairy cows. Although native, or low grade cattle have not the power of transmitting, with certainty their good qualities, other things being equal, it is well to give preference to calves out of the best milkers, though attention should be given to form and other peculiarities which give promise of usefulness at the pail. Among these are the color of the skin, breadth of hips, taper of neck and head, large stomach, development of the "escutcheon," or "milk mirror" (discussed in another chapter), and general *feminine* appearance, as distinguished from masculine and beefy characteristics.

Those which make the most rapid growth, and take on flesh most kindly are not necessarily the ones to be selected as the future milch cows, but on the contrary, unless possessing other indications of future usefulness at the pail, are to be rejected. Other things being equal, cows of gentle, quiet disposition, give best results at the pail, and hence calves should be subjected to gentle and kind treatment while young, and, where practicable, accustomed to the halter while young and easily managed.

They should be kept in a thrifty, growing condition, without pampering on the one hand, or neglect on the

other. If pampered, there is risk of impairing their health, while neglect, and the resulting check in growth, will reduce the size of the animal, delay breeding, and thus postpone the commencement of their usefulness, and diminish the profit derived from them.

The age at which they should be allowed to breed will depend upon the breed, the use to be made of them—some breeds being habitually more precocious than others—and upon the keep and thrift of the individual. As a general principle, if the owner has no preference as to the season of the year in which the calves are to be dropped, it is well to let natural causes control the time at which heifers will commence to breed, provided they have abundant food and good attention, both during the period of gestation and while rearing the first calf. Under natural circumstances they will seldom commence to breed too early for their own proper development, or the profit of their owners.

Early breeding is desirable, if the heifers are so well fed, or have access to such pasturage, as will prevent a serious check to their growth, since the early exercise of their milk-producing powers, while yet growing, will more fully develop these powers, and establish the habit while still impressible.

Nature indicates by the desire for the male on the part of heifers the earliest period at which they can commence to breed. If milk is the object in view, this impulse need not be restrained, except to control the time of parturition.

THE AVERAGE PERIOD OF GESTATION, 284 DAYS.

This varies with individuals, but calculations should be based on the average, and the male admitted as nearly as the natural periods of desire (which occur about every twenty-one days), will admit, that length of time before it is desired to have the calf dropped.

One or two connections with the male will be as effectual as more, if the cow is removed from the annoyance of other cattle until her passion passes off.

Our native cattle that are well treated and supplied with abundant food from calf-hood, will usually, if left to their natural instincts, drop calves when from two to three years of age. The Jerseys, unless restrained, usually bear at a much earlier age than any other breed, many of them dropping calves at the age of 15 to 18 months. In Southern Georgia, where cattle use upon "the range," without attention, they usually do not commence to breed until more than two years of age, and often not until they are three or more years old. If beef animals are to be reared heifers should be well grown before commencing to breed, but there are several material advantages in having those intended for the dairy commence breeding early. The heifer that commences to breed very young has her milk-producing faculties more fully developed than one that does not commence until her growth is fully attained. One that drops a calf at two years old commences one year earlier to return profits to her owner than one that drops one at three years of age, reaches the period of greatest usefulness earlier, will usually, other things being equal, make a more docile and profitable cow; and, as far as observation goes, continue profitable at the pail to an equally advanced age.

TREATMENT BEFORE CALVING.

No special attention is necessary during pregnancy, except to keep the cow in a healthy, thrifty condition, until a week or two previous to calving, when stimulating food should be withheld for a week or two previous to the time when the record, if one is kept, shows the calf is due. If no record of the date of service by the male has been kept, the springing of the udder will indicate the approach of

parturition. If there is such an accumulation of milk in the udder before calving as to cause risk of fever, or garget, a sufficient quantity of milk should be drawn daily to relieve the distention and remove all danger of inflammation or caking of the udder. There is a very general impression that drawing the milk before calving causes serious injury to the calf, since the first milk is (correctly) supposed to have medicinal properties beneficial to the calf. Experience, however, of the best and most careful breeders has demonstrated that no injury results to the calf from such a course, while the safety of the cow, especially if a deep milker, often demands it. Besides, all of the milk is not taken at any one time before calving, so that the calf is in fact not deprived of the benefits of the first milk. If cows are properly fed before calving, on food moderately laxative, or have the run of pasture, not one in a thousand will experience any difficulty in calving. Heifers with their first calf are more liable to be troubled with caked bag, or garget than older cows, and deep mikers are more subject to it than poor ones.

Close attention, however, should be given to all cows for a few days before and after calving, but there should be no interference with nature unless absolutely necessary, and then nature's process should be *aided, not forced.* Drawing a portion of the milk before calving will usually prevent all danger of injury to the bag. The milk, however, will not always flow, though the udder is distended and hard. In speaking of such cases, Allen says: "A washing of salt and water, weak soap-suds, or bathing in water alone is good. An ointment of camphor, mixed with cream or hog's lard, or fresh butter, may be used, well rubbed in by hand all over the udder and teats. These failing, a sack or woolen cloth—part of an old blanket or carpet—may be made large enough to enclose the udder and forward along the belly, and in rear up into the

twist, secured by strapping it over her back. This sack should then be kept thoroughly saturated with mildly warm water, which may quite relieve her difficulty, when the washes and ointments fail."

Mr. Peters uses in such cases hog's lard and arnica. He says, in "Southern Enterprise," "Melt the lard and pour in the arnica, equal quantities of each—rub the cow's bag with this three times a day." He has used this repeatedly with most satisfactory results If cows are properly managed before calving, however, they will usually pass through parturition safely, and without assistance from the keeper. When the calf is dropped the dam should be allowed to follow her natural instincts, and lick it dry. This removes the slimy coatings, and her breath warms the newcomer, who is soon able to stand and find the teat, which it does instinctively. A soon as the calf has sucked all it needs, the udder of the cow should be milked to emptiness. A warm bran mash, diluted with blood-warm water, so that it may be drank, should be given at the first milking, and if the cow appears much weakened by the trying ordeal through which she has passed, this may be repeated for several days until she gives evidence of restored strength. The udder should be entirely emptied twice a day, and as soon as all fever has subsided the quantity of food should be increased, or free access to pasture allowed. If the placenta is voided promptly, as it will usually be by a healthy cow, it should be immediately removed and buried. If a portion of it remains hanging in the vulva, as it will often do in cows in low condition, no violence should be used in removing it, but a laxative drink, such as boiled flax-seed, salts or meal gruel should be given. Only in exceptional cases, however, will more than ordinary prudence and care be necessary. The quantity and strength of the food given should be gradually increased, using care never to give more than will be consumed with a relish. If

given in excess the appetite will be cloyed, and a reduction in the flow of milk, if not sickness, result.

Animals, like men, prefer a varied diet, and thrive better on a variety of food, even if not so rich, than upon the same rations day after day. A cow turned into a pasture, in which there is variety, will not confine herself to any one plant, but will partake of the grasses, clover and weeds apparently with equal relish, and will consume much more in consequence of the variety. In the spring, when vegetation is very succulent, a little corn meal and wheat bran, one part by measure of the former to two of the latter, given twice daily, will conduce to both health and profit.

Gentle treatment of milch cows is of much greater importance than is generally understood by owners of cattle. Cows should never be struck nor scolded while being milked. A full flow of healthy milk need not be expected from cows that are excited to fear by ill treatment. The utmost gentleness, kindness and quiet should be exercised by the milkers.

Punctuality as to the time of feeding and milking is also important. Cows acquire habits and become restless if not fed or milked at the hour at which they expect it. Quiet, contentment and regularity of habit are necessary to secure the maximum yield of either beef or milk.

Thorough milking is another essential to success in dairying. It will be in vain to secure fine stock and feed liberally if the milking is not thoroughly and regularly done. Milk left in the udder will either be re-absorbed, or become caked and injure the bag. In either case a reduction in the flow of milk results. In all cases where cows are driven to the lot to be milked, each should have her stall under a shelter, close overhead, but well ventilated at the sides. A little meal and bran should be placed in a tub or trough in each stall before the cows are turned in. Each

cow will soon learn to go quietly to her stall, where she should be at once secured by a rope or stanchel. The rations of meal will not only induce the cows to go willingly to their stalls, but will increase the flow, improve the quality of the milk and prevent scouring, so common when cattle feed entirely upon grass.

Cleanliness, both in the management of the cows and in milking, should be scrupulously observed. The stalls should be kept clean and free from all offensive odors, and the milker should be provided with water and a cloth with which to thoroughly cleanse the udder and teats before milking. No matter what one's fondness for milk, his stomach would naturally revolt against drinking that drawn from a cow whose sides are caked with manure, or whose escutcheon is coated with ticks, and yet how often do we see cows in one or the other condition.

The treatment of milk subsequent to drawing from the udder will be noticed under the chapter on "Milking and Management of the Milk." Young cows with their first calves require especial attention. They are then in a formative stage, so far as the development of their milk-producing capacity is concerned, and should receive that treatment which will best conduce to such development. They should be well fed, thoroughly milked, kindly and gently handled, and kept at the pail as long as practicable to acquire proper habits. If they have been accustomed to the halter from calfhood there will be but little difficulty, either in their management, or in establishing such habits as will render them useful animals during the remainder of their lives.

A mistake very common in the South is keeping more cows than can be properly cared for. Cattle poorly fed and cared for are seldom profitable, while there is no animal which gives a more profitable return for food and attention than a good cow.

The following schedule of values, graded according to the yield of milk, will be suggestive to those farmers who keep large herds of inferior cattle. If cows are kept for their milk, and valued solely on account of their yield in this respect, one that yields one gallon of milk daily is worth about $10.00, less than her value as beef when fat, if of ordinary size. One that will yield two gallons daily will be worth $20.00, three gallons $45.00, four gallons, $75.000, five gallons $120.00, and six gallons $200.00. This may seem at the first glance somewhat arbitrary, but when reduced to a calculation will be found to be based on sound reason. It will require the same outlay for food, the same attention, and the same house-room for the cow whose capacity is one gallon as for one yielding six gallons per day. The one gallon cow will not pay for her food and attention unless she runs on the commons during summer and in the swamp in winter. If one gallon is the limit of her milking capacity, extra feeding will only improve her condition as a beef animal, and the sooner she is converted into beef, the better for her owner. Ordinarily one good cow, well fed and cared for, will not only prove more profitable to her owner than three inferior ones poorly fed and cared for, but yield as much milk in quantity and of far better quality.

FEEDING THE COWS.

A milch cow should be regarded as a complicated piece of animated machinery peculiarly adapted for supplying food for man, and dependent upon him to a large extent for the food necessary to insure her maximum usefulness. It should be remembered that the cow, in her natural state, yields only enough milk to supply the calf, and that for only a few months, until its stomach is prepared to digest the natural food of adult cattle. The large yield of milk gotten from cows is due to the effects of domestication,

care and selection. The modern cow is in an abnormal condition produced by man's skill, from which there is a constant tendency to return or deteriorate to the normal state. To maintain, therefore, the vantage ground now occupied, the exercise of the same skill that has been used in the improvement must be exercised in its perpetuation. The best herd in America, turned out on the commons to eke out a bare livelihood, will rapidly degenerate into mere scrubs inferior to the common native cattle of the country, which have more vigorous constitutions and are better able from habit to endure neglect.

The fact that both the quantity and quality of milk are influenced by the abundance and character of the food consumed by cows, is well known to every one who has ever owned a cow; but very few make the most profitable use of such information.

Numerous instances have been brought to the notice of the writer, in which the owners of valuable cows, desirous of rapidly increasing the flow and improving the quality of the milk, have defeated their object and injured their cows by ignorance of the character of their stomachs.

The cow has four stomachs: The first and largest, the *rumen,* or "paunch," into which the food is deposited when first swallowed with very little mastication, is the largest, and occupies the larger portion of the abdominal cavity. The food, after passing through this cavity and into the *reticulum* or second stomach, remains until the animal has a period of rest, when rumination, commonly called "chewing the cud," commences. The æsophagus gullet or duct leading from the pharynx to the upper orifice of the stomach, has an opening into each stomach. Solid food, however, when first swallowed, invariably passes into the *rumen* or paunch in which it is passed around through its different compartments, and finally forced, by combined peristaltic and spasmodic action, a pellet at a

time, into the second stomach or *reticulum*, whence the pellets are, by a contraction of the *reticulum*, forced again up the æsophagus into the mouth for more thorough mastication. This done it is swallowed, and being now softer and more pliant, passes down to the *manyplus*, or third stomach, in which it is still further comminuted and reduced to a pulpy mass, when it is passed on to the fourth stomach, or *abomasum*, in which the process of digestion proper takes place under the agency of the *gastric juice*, which converts the food thus prepared by the first three stomachs into a fluid called chyme. Thus reduced to a solution the food passes through the *pyloric*, or lower orifice of the stomach, into the first intestine or *ducdenum* "where its separation into the nutritive and innutritive portions is effected and the former begins to be taken up and carried into the system."

Now if a cow is fed too exclusively upon concentrated food the *rumen* or first stomach is not sufficiently distended for healthy peristaltic action, and the food is passed through without proper and thorough digestion. The cow, as well as other ruminants, is supplied with the *rumen* or large receptacle for the purpose of storing and preparing large quantities of "roughness" and should be fed in accordance with these indications of nature. The natural food of the cow is green grass, and if she can get a plenty of this she needs nothing more. In our climate the provident farmer can have an abundance of green food every day in the year. During the summer months it will not be necessary to feed if good pastures are provided, though a small ration of bran and pea-meal or bran and corn-meal, three quarts of the bran to one of the meal, twice a day, will prove beneficial when the grass is unusually succulent in spring, or rendered so by excessive rain during summer. Another advantage of feeding daily throughout the year is, that the cows, if turned to pasture during the day, will come to be

fed punctually at the hour for milking, and will submit more quietly to being milked if engaged in eating at the same time. Bran and boiled cotton-seed or bran and cotton seed meal, three quarts of bran to one-half gallon of the seed, or three quarts of bran to one pint of the meal, answer a good purpose.

On every farm on which milch cows are kept in Georgia, and especially in the cotton belt, where no especial attention is given to providing pasturage, a small area of rich land should be devoted to some forage crop with which to supplement the pastures in case of severe drouth and consequent failure of pastures. Frequent sowings of drilled corn or several plantings of cat tail millet will answer the purpose. The preference should be given to the drilled corn, from the fact that if not needed for feeding green it makes better cured fodder than the millet. It often happens, when no provision of this kind is made, that cows fall back in their milk on short pasturage and never recover after the grass becomes abundant. Fodder corn, or millet fed at such times would prevent such loss.

Provision should be made also for supplementing pasturage in the early fall before pea fields are opened. Millet and pea-vines cut and fed night and morning will best serve for this purpose. Late sown drilled corn is usually destroyed by the boll or corn worm and hence cannot be relied upon.

For a supply of green food during winter and spring a quarter of an acre of rich land for each milch cow kept, should be thickly sown in rye or barley, or both mixed. This should not be pastured but cut and fed to the cows twice a day, in connection with dry roughness of some kind, and a mixture of bran with some kind of meal or cotton seed or cotton seed meal. Turnips, parsnips, pumpkins, sweet potatoes, beets or collard leaves may be used in connection with the green small grain and dry food.

There need be no difficulty about having plenty of appropriate food for cows in Georgia if advantage is taken of our advantages of soil and climate.

One acre of small grain cut and fed to cows will supply as many as four acres, pastured in the usual way.

Rye sown very thick early in September or the latter part of August on rich or well manured land will be ready for cutting for feeding purposes by the 15th of November, and may be cut daily from that date, (except in unusually cold spells when it is better not to disturb it) until May, when the ground may be planted in another crop.

When pastured, the hoofs of the cattle destroy much of the tender grain besides, except when the ground is quite dry, injuring the soil. Again, the cut grain may be fed regularly, while the cows are often deprived of the pasturage for weeks at a time, when the ground is too wet to admit them without injury to the soil. For the last two winters the writer has cut rye daily (except a few days when frozen) from the 15th of November to the May following.

The same area grazed would not have supplied pasturage one-fourth of the time. There is no excuse, therefore, for a scarcity of milk nor for any farmer to have inferior butter upon his table at any season of the year in any section of Georgia, and yet so little attention is given to dairy cows and dairy products that "country butter" has become synonymous with "poor butter." Those who give proper attention to feeding and milking their cows, and to the management of the milk and butter, produce as fine an article as can be found anywhere, but such are, as yet, the exceptions.

The following tables of 'nutritive values of different feeding stuffs" will be useful to those who desire to give attention to economical feeding:

NUTRITIVE VALUE OF DIFFERENT FEEDING STUFFS.

Prof. W. O. Atwater, of Counecticut, reported the following tables to the *American Agriculturist* during the early part of this year. They will repay careful study :

TABLE No. 1.

Average Composition, Digestibility and Money Value, as given by Dr. Wolff, for Germany, 1880, *in Farmer's Almanac.*

I.—HAY.

KIND OF FODDER.	PER CENT.—ORGANIC SUBSTANCE.									Nutritrive Ratio—As 1.	Dollars per 100 lbs—$.
			Total.				*Digestible.*				
	Water.	Ash.	Albuminoids.	Fibre.	Other Carbohydrates.	Fat.	Albuminoids.	Carbohydrates, Including Fibre	Fat.		
Meadow Hay, poor	14.3	5.0	7.5	33.5	38.2	1.5	3.4	34.9	0.5	10.6	0.48
" " medium	14.3	6.2	9.7	26.3	41.4	2 5	5.4	41.0	1.0	8.0	0.64
" " very good	15.0	7.0	11.7	21.9	41.6	2.8	7.4	41.7	1.3	6.1	0.75
Red clover, poor	15.0	5.1	11.1	28.9	37.7	2.1	5.7	37.9	1.0	7.1	0.59
" " medium	16.0	5.3	12.3	26.0	38.2	2.2	7.0	38.1	1.2	5.9	0.70
" " very good	16.5	6.0	13.5	24.0	37.1	2.9	8.5	38.2	1.7	5.0	0.79
White Clover. medium.	16.5	6.0	14.5	25.6	33.9	3.5	8.1	35.9	2.0	5.0	0.76
Lucerne, medium.	16.0	6.2	14.4	33 0	27.9	2.5	9.4	28.3	1.0	3.3	0.71
Swedish (Alsike) Clover	16.0	6.0	15.0	27.0	32.7	3.3	8.6	34.8	1.8	4.6	0.76
Fodder Vetch, medium.	16.7	8.3	14 2	25.5	32.8	2.5	9.4	32.5	1.5	3.9	0.77
Peas in bloom.	16.7	7.0	14.3	28.2	34.2	2.6	9.4	33.1	1.6	4.0	0.77
Fodder Rye	14.3	5.1	10.4	23.1	44.5	2.8	6.6	44.3	1.3	7.2	0.72
Timothy.	14.3	4.5	9.7	22.7	45.8	3.0	5.8	43.4	1.4	8.1	0 70
Italian Rye Grass	14.3	7.8	11.2	22.9	40.6	3.2	7.1	41.5	1.4	6.3	0.74
Upland Grasses, average	14.3	5.8	9.5	28.7	39.1	2.6	5.3	40.9	1.1	8.2	0.64
Hungarian Grass	13.4	5.7	10.8	29.4	38.5	2.2	6.1	41.0	0.9	7.1	0.66
II.—GREEN FODDER.											
Grass just before bloom	75.0	2.1	3.0	6.0	13.1	0.8	2.0	13.0	0.4	7.0	0.22
Pasture Grass	80.0	2.0	3.5	4.0	9.7	0.8	2.5	9.9	0.4	4.4	0.21
Rich Pasture Grass	78.2	2.2	4.5	4.0	10.1	1.0	3.4	10.9	0.6	3.6	0.27
Italian Rye Grass	73.4	2.8	3.6	7.1	12.1	1.0	2.3	12.6	0.4	5.9	0.23
Timothy Grass	70.0	2.2	3.4	8.0	16.3	1.1	2.1	16.0	0.5	8.2	0.28
Upland Grasses, average	70.0	2.1	3.4	10.1	13.4	1.0	1.9	14.2	0.5	8.1	0.23
Fodder Rye.	76.0	1.6	3.3	7.9	10.4	0.8	1.9	11.0	0.4	6.3	0.20
Fodder Oats	81.0	1.4	2.3	6.5	8.3	0.5	1.3	8.9	0.2	7.2	0.15
Fodder Corn	82.9	1.3	1.2	5.2	8.8	0.6	0.7	8.4	0.3	13.0	0.12
Sorghum	77.3	1.1	2.5	6.7	11.7	0.7	1.6	11.9	0 3	7.4	0.19
Hungarian, in blossom	75.0	1.8	3.1	8.5	10.9	0.7	1.8	11.8	0.3	7.0	0.20
Pasture Clover, young	83.0	1.5	4.6	2.8	7.2	0.9	3.6	7.4	0.6	2.5	0.25
Red Clover, before blossom	83.0	1.5	3.3	4.5	7.0	0.7	2.3	7.4	0.5	3.8	0.19
Red Clover, in full blossom	80.4	1.3	3.0	5.8	8.9	0.6	1.7	8.7	0.4	5.7	0.17

TABLE No. 1.—GREEN FODDER.—*Continued.*

KIND OF FODDER.	PER CENT.—ORGANIC SUBSTANCE.									Nutritive Ratio—As 1.	Dollars per 100 lbs.—$.
			Total.				*Digestible.*				
	Water.	Ash	Albuminoids	Fibre.	Other Carbohydrates.	Fat.	Albuminoids.	Carbohydrates. Including fibre	Fat.		
White Clover, in blossom	80.5	2.0	3.5	6.0	7 2	0.8	2.2	7.9	0.5	4.2	0.16
Alsike Clover, beginning of blossom	85.0	1.5	3.3	4.5	5.1	0.6	2.1	5.8	0.4	3.2	0.17
Lucerne, " "	74.0	2.0	4.5	9.5	9.2	0.8	3.2	9.1	0.3	3.1	0.23
Fodder Vetch, " "	82.0	1.8	3.5	5.5	6.6	0 6	2.5	6.7	0.3	3.0	0.18
Fodder Peas in blossom	81.5	1.5	3.2	5.6	7.6	0.6	2.2	7 4	0.3	3.7	0.18
Buckwheat in blossom	85.0	1.4	2.4	4.2	6.4	0.6	1.5	6.6	0.4	5.1	0.14
Fodder cabbage	84.7	1.6	2.5	2.4	8.1	0.7	1.8	8.2	0.4	5.2	0.17
Carrot leaves	82.2	3.6	3.2	3.0	7.1	1.0	2.2	7.0	0.5	3.8	0.18
Rutabaga leaves	88.4	2 3	2.1	1.6	5.2	0.5	1.5	5.1	0.3	3.9	0.12
Fermented Corn Fodder	78.6	1.7	1.2	8.4	9.0	1.1	0.7	10.4	0.5	16.6	0.15
III.—STRAW.											
Winter Wheat	14.3	4.6	3.0	40.0	36.9	1.2	0.8	35.6	0.4	45.8	0.37
Winter Rye	14.3	4.1	3.0	44.0	33.3	1.3	0.8	36.5	0.4	46.9	0.35
Summer Barley	14.3	4.1	3 5	40.0	36.7	1.4	1.3	40.6	0.5	32.2	0.44
Oat	14.3	4.0	4.0	39.5	36.2	2.0	1.4	40.1	0.7	29.9	0.45
Fodder Vetch	16.0	4.5	7.5	42.0	29.0	1.0	3.4	31.9	0.5	9.8	0.46
Pea	16.0	4.5	6.5	38.0	34.0	1.0	2.9	33.4	0.5	12.0	0.44
Field Bean	16.0	4.6	10.2	34.0	34.2	1.0	5.0	35 2	0.5	7.3	0.55
Seed Clover	16.0	5.6	9 4	42.0	25.0	2.0	4.2	28.5	0.0	7.4	0.49
Corn Stalks	15.0	4.2	3.0	40.0	36.7	1.0	1.1	37.0	0.3	34.4	0.39
CHAFF, HULLS, ETC.											
Wheat	14.3	9.2	4.6	36.0	34.6	1.4	1.4	32.8	0.4	24.1	0.37
Rye	14 3	7.5	3.6	43.5	29.9	1.2	1.1	34.9	0.4	32.6	0.37
Oats	14.3	10.0	4.0	34.0	36.2	1.5	1.6	36.6	0.6	23.8	0.39
Barley	14.3	13.0	3.0	30.0	38.2	1.5	1.2	35.0	0.6	30.4	0.38
Pea	15.0	6.0	8.1	32.0	36.9	2.0	4.0	36.2	1.2	9.8	0.55
Bean	15.0	5.5	10.5	33.0	34.0	2.0	5.1	34.7	1.2	7.4	0.53
Corn Cobs	14.0	2.8	1.4	37.8	42.6	1.4	0.6	41.7	0.4	71.:	0.41
ROOTS AND TUBERS.											
Potatoes	75.0	0.9	1.1	1.1	21.7	0.2	1.1	22.8	0.2	21.6	0.26
Jerusalem Artichokes	80.0	1.0	2.0	1.3	15.5	0.2	2.0	16.8	0.2	8.7	0.24
Fodder Beets	88.0	0.8	0.5	0.9	9.7	0.1	0.5	10.6	0.1	21.7	0.12
Sugar Beets	81.5	0.7	1.0	1.3	15.4	0.1	1.0	16 7	0.1	17.0	0.19
Carrots	85.0	0.9	1.4	1.7	10.8	0.2	1.4	12.5	0.2	9.3	0.18
Rutabagas	87.0	1.0	1.3	1.1	9.5	0.1	1.3	10.6	0.1	8.3	0.15
Turnips	92.0	0.7	1.1	0.8	5.3	0.1	1.1	6.1	0.1	5.8	0.11
Parsnips	88.3	0.7	1.6	1.0	10.2	0.2	1.6	11.2	0.2	7.3	0.18

TABLE No. 1.—*Continued.*

GRAINS AND FRUITS.

KIND OF FODDER.	PER CENT.—ORGANIC SUBSTANCE.									Nutritive Ratio—As 1.	Dollars per 100 lbs.—$.
			Total.				*Digestible.*				
	Water.	Ash.	Albuminoids.	Fibre.	Other Carbohydrates.	Fat.	Albuminoids.	Carbohydrates, including fibre.	Fat.		
Wheat	14.4	1.7	13.0	3.0	66.4	1.5	11.7	64.3	1.2	5.8	1.13
Rye	14.3	1.8	11.0	3.5	67.4	2.0	9.9	65.4	1.6	7.0	1.08
Barley	14.3	2.2	10.0	7.1	63.9	2.5	8.0	58.9	1.7	7.9	0.95
Oats	14.3	2.7	12.0	9.3	55.7	6.0	9.0	43.3	4.7	6.1	0.98
Indian Corn	14.4	1.5	10.0	5.5	62.1	6.5	8.4	60.6	4.8	8.6	1.11
Buckwheat	14.0	1.8	9.0	15.0	58.7	1.5	6.8	47.0	1.2	7.4	0.77
Rice, hulled	14.0	0.5	7.7	2.2	75.2	0.4	6.9	72.7	0.3	7	0.96
Peas	14.3	2.4	22.4	6.4	52.5	2.0	20.2	54 4	1.7	2.9	1.44
Field Beans	14.5	3.1	25.5	9.4	45.9	1.6	23.0	50.2	1.4	2.3	1.51
Linseed	12.3	3.4	20.5	7.2	19.6	37.0	17.2	18.9	35.2	...	2.47
Rape seed	11.8	3.9	19.4	10.3	12.1	42.5	15.5	10.2	40.4	....	2.55
Hemp seed	12.2	4.5	16.3	12.1	21.3	33.6	12.2	16 2	30.2	...	2.01
Cotton seed	7.7	7.8	22.8	16.0	15.4	30.3	17.1	14.7	27.3	...	2.08
Apples and Pears	83.1	0.4	0.4	4.3	11.8	...	0.3	12.9	...	43.0	0.13
Pumpkins	89.1	1.0	0.6	2.7	6.5	0.1	0.4	7.1	0.1	18,4	0.08
IV.—MANUFACTURING AND WASTE PRODUCTS, ETC.											
Sugar Beet cake	70.0	3.4	1.8	6.3	18.3	0.2	1.8	24.6	0.2	13.9	0.30
Potato, Rye, Wheat, } Residue from manufacture of starch.	86.0	0.4	0.8	2.0	11.7	0.1	0.8	13.7	0.1	17.4	0.16
	70.0	0.8	6.1	2.7	18.9	1.5	5.2	18.1	1 2	4.1	0.44
	74.0	0.6	4.4	3.4	15.4	2.2	3.7	15.1	1.8	5.3	0.37
Brewers' Grains	76.6	1.2	4.9	5.2	11.0	1.1	3.9	10.8	0.8	3.4	0.30
Malt Sprouts	10.1	7.2	17.6	14.3	48 7	2.1	12.8	51.6	1.7	4.7	1.09
Wheat Bran, fine	13.1	5.4	14.0	8.7	55.0	3.8	11.8	44.4	3.0	4.4	1.04
" " coarse	12.9	6.6	15.0	10.1	52.2	3.2	12.6	42.7	2.6	3.9	1.04
Rye Bran	12.5	5.2	14.5	5.7	58.6	4.5	12.2	46.2	3.6	4.5	1.10
Wheat Meal	11.5	3.0	13.9	4.8	63.5	3.3	10.8	54.0	2.9	5.7	1.08
Indian Corn Bran	11.8	3.4	10.2	9.0	61.8	3.8	7.9	56.6	3 4	8.2	0.99
Buckwheat Bran	14.0	3.4	17.1	14.7	46.4	4.4	13.5	44.0	3.9	4.0	1.15
Rice Meal	9.9	10.6	10.9	11.1	47.6	9.9	8.6	47.2	8.8	8.0	1.16
Linseed Cake	12.2	8.8	29.5	9.7	29.9	9.9	24.8	27.5	8.9	2.0	1.72
Linseed Meal (extracted)	9.7	7.3	33.2	8.8	38.7	2.3	27.8	33.9	2.1	1.4	1.61
Palm Nut Cake	10.5	4.2	16.9	17.4	41.0	10.0	16.1	55.4	9.5	4.9	1 61
Cotton Seed Cake	11.3	6.4	22.6	22.1	30.5	6.1	17.5	14.9	5.5	1.7	1.14
" " " decorticated	11.2	7.6	38.8	9.2	19.5	13.7	31.0	18.3	12.3	1.6	2.07
Flesh Meal	11.5	3.7	72.8	...	...	12.0	69.2	...	11.2	0.4	3.54
Dried Blood	12.0	4.1	80.8	..	2.6	0.5	54.1	2.6	0.5	...	2.32
Cow's Milk	87.5	0.7	3.2	...	5.0	3.6	3.2	5.0	3.6	4.4	0.34
Skimmed Milk	90.0	0.8	3.5	...	5.0	0.7	3.5	5.0	0.7	1.9	0.23
Buttermilk	90.1	0.5	3.0	...	5.4	1.0	3.0	5.4	1.0	2.6	0.22
Condensed Milk	21.5	2.5	10.2	.	52.9	12.9	10.2	52.9	12.9	8.3	1.48
Whey	92.6	0.7	1.0	...	5.1	0.6	1.0	5.1	0.6	6.6	0.11
Cream	62.0	0.6	2.7	...	2.9	31.8	2.7	2.9	31.8	0.5	1.54

EXPLANATION OF THE TABLE.

The table herewith is taken, with some slight alterations, from a much larger one by Wolff, in the "German Farmers' Almanac." These figures, from European products mostly German, represent the average results of many hundreds of analyses, but they enable American farmers to estimate the probable composition of their own feeding stuffs. So far as analyses made up to the present time show, the American and European products in general agree pretty closely. The most marked exceptions are in grasses and hays, ours averaging poorer than the European, probably because of poor manuring and much poorer culture.

Water.—The figures in the first column give the number of pounds of water in 100 pounds. Thus 100 pounds of young grass contain from 75 to 80 pounds of water, while 100 pounds of dry hay contain only about 14½ pounds. In 100 pounds of bran there are about 13 pounds of water, while 100 pounds of potatoes contain 75 pounds of water, and 100 pounds of turnips 92 pounds of water. The bran thus has (100-13) about 87 per cent., or ⅞ of dry substance; the potatoes 25 per cent. or ¼; and the turnips only 8 per cent., or one-twelfth dry matter.

Ash or Mineral Matters.—The mineral matters, potash, soda lime, phosphoric acid, etc., which remain as ashes when the material is burned, vary from ¾ pound in 100 pounds of milk, to from 5 to 8 pounds in 100 pounds of bran or linseed cake. These substances are necessary for supporting animal life, but there is generally an abundance of them in all the foods used on the farm.

Organic Substance, Total and Digestible.—Columns 2 6 give the Albuminoids, Carbo-hydrates and Fats, which together make up the combustible or Organic Substance. Columns 7, 8 and 9 give the amounts of these that are digestible. The figures represent general averages, as

shown by the results of probably more than 1,200 actual feeding trials, with oxen, cows, horses, sheep and swine. The digestibility of the materials, as Hungarian grass, which have not been tested, is calculated from the known digestibility of similar foods.

Nutritive Ratio.—The "nutritive ratio" expresses the ratio of digestible albuminoids to digestible carbo-hydrat and fats (each pound of fats being assumed equal to 2.5 of carbo-hydrates); that is to say it shows the number of pounds of digestible carbo-hydrates to one pound of digestible albuminoids. For instance, the "poor" hay contains 1 pound of albuminoids to 10.6 pounds of digestible carbo-hydrates. The nutritive ratio is 1 : 10.6. The "very good" hay has 1 of albuminoids to every 6.1 of carbo-hydrates. The ratio is 1 : 6.1. Linseed cake and cotton seed cake are rich in digestible albuminoids, having 1 pound to every 2 pounds of carbo-hydrates, while straw is very poor, the nutritive rate being 1 to 30 or even 1 to 45. The value of a food in practice depends mainly upon the amounts and proportions of digestible ingredients it contains, and the way it is fed. The "as 1" at head of column, "Nutritive Ratio," means *as one to*—.

The Money Value of the Foods in the table are calculated by assigning a certain price to each pound of digestible ingredients. The prices assumed by Wolff for the German market in 1880, are for digestible albuminoids and fats, each 4½ cents per pound, and for carbo-hydrates nine-tenth cents per pound. They vary a little, but not widely, from the values in many of our American markets. Of course these values are relative, and apply only when properly fed. Doubtless both the prices current in our markets, and the intrinsic facts of the case would require a revision of these rates to make the valuations entirely correct with us. Nor can such computations be absolutely accurate at best, but they do give a general idea of the

comparative values of the materials as food for stock *when properly used.*

TABLE No. 2.

ECONOMY IN CATTLE FEEDING, COMPOSITION OF FOODS, FEEDING STANDARDS AND RATIONS FOR FARM ANIMALS.

Table No. 1 gave the average amounts of the food ingredients, albuminoids, carbo-hydrates and fats contained in different foods, and likewise the amounts of these that are from feeding trials, estimated to be actually digestible. It is the digestible parts of the food that supply the wants of the animal, that are made over into flesh and fat, skin and bone, milk and progeny, and are used to produce heat to keep the body warm, and muscular power for work. It is with these, therefore, that we have mainly to do in feeding.

FEEDING STANDARDS.

Having noted how much of the nutritive ingredients our feeding stuffs contain, the next step is to learn how much of each different animals need for maintenance and for production of meat, milk, work, etc. The German experimenters have studied into this matter very carefully, in two ways: first, by experiments, feeding animals with different kinds and amounts of food, and noting the effects; second, by observing the methods and results of feeding, as practiced by the most successful farmers. On the basis of these two kinds of observations feeding standards have been calculated, as shown below. In brief, it has been found that full-grown oxen at rest in the stall, can be kept for long periods in fair condition with food of such sort as to supply them, per 1,000 lbs. live weight, with 0.6 lbs. albuminoids, and 7.0 lbs. carbo-hydrates, in forms to be digested and taken into the circulation. It has been found well to have this supplied by 14-15 lbs. dry substance in the food. With rations furnishing these amounts of digestible ingredients, there has sometimes

been observed a slight improvement, but perhaps oftener a small falling off in condition. It appears on the whole, better to increase the ration, so as to give 0.7 lbs. nitrogenous, and a little over 8 lbs. non-nitrogenous nutrients, with a nutritive ratio of 1:12. It seems to make little difference in what forms these are given, whether in hay, straw, oat-meal or otherwise, provided the food be wholesome and palatable. These materials suffice to make up for the wastes of the animal's body, to keep it warm, and to produce the small amount of muscular power needed when the animal is at rest.

If, now, the ox is to be worked or fattened, food for production of meat or force is required. Or if, instead of an ox, we have a milch cow, she will need food for production of milk, in addition to what is necessary to maintain her body in good condition. And this food for production must be not only larger in quantity, but different in quality; it must have a larger proportion of albuminoids, as the Germans say, the nutritive ratio must be narrower. Thus Wolff recommends for a daily ration for milch cows, per 1,000 lbs. live weight, 2.5 lbs. digestible albuminoids, 12.5 digestible carbo-hydrates, and 0.4 lbs. digestible fats, with a nutritive ratio of 1:5.4. This is just about what would be contained in 30 lbs. of fine quality, young, cut hay, or 120 lbs. of young grass, either of which would make a very good daily ration for milch cow. The following table by Wolf, from the "Farmer's Almanac" referred to, gives feeding standards for various domestic animals. The first column gives the total amount of organic substance—that is, the whole food, less water and ash, in the daily ration. The next three columns give the amounts of digestible albuminoids, carbo-hydrates, and fats. The fifth column, "Total nutritive substance," is the sums of the digestible nutriments in the previous three columns. The last column gives the ratio of albuminoids to carbo-hydrates, or the nutritive ratio.

L. of C.

Feeding Standards.

KIND OF ANIMAL, WEIGHT, AGE, ETC.	Total organic substances.	Nutritive (digestible) substances.			Total nutritive substance.	Nutritive ratio.
		Albuminoids.	Carbohydrates.	Fats.		
A—PER DAY AND PER 1,000 POUNDS LIVE WEIGHT.	lbs.	lbs.	lbs.	lbs	lbs.	as 1:
1. Oxen at rest in stall.	17.5	0.7	8.0	0.15	8.85	12.
2. Wool sheep, coarser breeds	20.0	1.2	10.3	0.20	11.70	9.
Finer breeds	22.5	1.5	11.4	0.25	13.15	8.
3. Oxen, moderately worked	24.0	1.6	11.3	0.30	13 20	7.5
Heavily worked	26.0	2.4	13.2	0.50	16.10	6.
4. Horses, moderately worked	22.5	1.8	11.2	0.60	13.60	7.
Heavily worked	25 5	2.8	13.4	0.80	17 00	5.5
5. Milch cows	24.0	2.5	12.5	0.40	15.40	5.4
6. Fattening oxen, 1st period	27.0	2.5	15.0	0.50	18.00	6.5
2d period	26.0	3 0	14.8	0.70	18 50	5.5
3d period	25.0	2.7	14.8	0.60	18.10	6.0
7. Fattening sheep, 1st period	26.0	3 0	15.2	0.50	18.70	5.5
2d period	25.0	3.5	14.4	0.50	18.50	4.5
8. Fattening swine, 1st period	36.0	5.0	27.5		32.50	5.5
2d period	31.0	4.0	20.0		28.00	6.0
3d period	23.5	2.7	17.5		20.20	6.5
9. Growing cattle:						
Age, months. *Average live weight per h'd*						
2— 3 150 lbs	22.0	4.0	13.8	2.0	19.8	4.7
3— 6 300 "	23.4	3.2	13.5	1.0	17.7	5.0
6—12 500 "	24 0	2.5	13.5	0.6	16.6	6.0
12—18 700 "	24.0	2.0	13.0	0.4	15.4	7.0
18—24 850 "	24.0	1.6	12.0	0.3	13.9	8.0
18. Growing sheep:						
5— 6 56 "	28.0	3.2	15.6	0.8	19.6	5.5
6— 3 67 "	25.0	2.7	13.3	0.6	16.6	5.5
8—11 75 "	23.0	2.1	11.4	0.5	14.0	6.0
11—15 82 "	22.5	1.7	10.9	0.4	13.0	7.0
15—20 85 "	22.0	1.4	10.4	0.3	12.1	8.0
Growing fat pigs:						
2— 3 50 lbs	42.0	7.5	30.0		37.5	4.0
3— 5 100 "	34.0	5.0	25.0		30.0	5.0
5— 6 125 "	31.5	4.3	23.9		28 0	5.5
6— 8 170 "	27.0	3.4	20.4		23.8	6.0
8—12 250 "	21.0	2.5	16.2		18.7	6.5
B.—PER DAY AND PER HEAD.						
Growing cattle:						
2— 3 150 lbs	2.3	0.6	2.1	0.30	3.00	4.7
3— 6 300 "	7.0	1.0	4.1	0.30	5.40	5.0
6—12 500 "	12.0	1.3	6.8	0.80	8.40	6.0
12—18 700 "	16.8	1.4	9.1	0.28	10.78	7.0
18—23 850 "	20.4	1.4	10.3	0.26	11.96	8.0

Feeding Standards.—Continued.

KIND OF ANIMAL, WEIGHT, AGE, ETC.	Total organic substance.	Nutritive (digestible) substances.			Total nutritive substance.	Nutritive ratio.
		Albuminoids.	Carbohydrates.	Fats.		
B.—PER DAY AND PER HEAD.	lbs.	lbs.	lbs.	lbs.	lbs.	as 1:
Growing sheep:						
5— 6 56 lbs . . .	1.6	0 18	0.87	0.045	1.095	5.5
6— 8 67 " . . .	1.7	0.17	0.85	0.040	1.060	5.5
8—11 75 " . . .	1.7	0.16	0.85	0.037	1 047	6.0
11—15 82 " . . .	1.8	0.14	0.89	0.032	1.062	7.0
15—20 85 " . . .	1.9	0.12	0.88	0.025	1.047	8.0
Growing fat swine:						
2— 3 50 lbs. . . .	2.1	0.38	1.50		1.88	4 0
3— 5 100 " . . .	3.4	0.50	2.50		3.00	5.0
5— 6 125 " . . .	3 9	0.54	2.96		3.50	5.5
6— 8 170 " . . .	4.6	0.58	3.47		4.05	6.0
8—12 250 " . . .	5.2	0.62	4.05		4.67	6.5

PRACTICAL APPLICATION—CALCULATION OF DAILY RATIONS FOR FARM ANIMALS.

To use the feeding standards, let us take some of the feeding stuffs in table No. 1, and leaving out of account the water, ash, and total amount of the ingredients, note the amounts of digestible ingredients as shown in the condensed table below:

Digestible Ingredients of Fodder Stuffs.

KIND OF FODDER.	Digestible food ingredients.			Nutritive ratio.
	Albuminoids.	Carbohydrates, including fibre.	Fats.	
I.—HAY.	per ct.	per ct.	per ct.	as 1:
Meadow Hay, poor	3.4	34.9	0.5	10.6
" " medium	5.4	41.0	1.0	8.0
" " very good	7.4	41.7	1.3	6.1
Red Clover, poor	5.7	37.9	1.0	7.1
" " medium	7.0	38.1	1.2	5.9
" " very good	8.5	38.2	1.7	5.0

Digestible Ingredients of Fodder Stuffs.— Continued.

KIND OF FODDER.	Digestible food ingredients.			Nutritive ratio.
	Albuminoids.	Carbohyd'tes including fibre.	Fats.	
II—STRAW.	per ct.	per ct.	per ct.	as 1:
Winter Wheat,	0 8	35.6	0.4	45.8
Winter Rye,	0.8	36 5	0 4	46.9
Oat,	1.4	40.1	0 7	29.9
III.—ROOTS AND TUBERS.				
Potatoes, Irish	1.1	22 8	0·2	21.6
Sugar Beets,	1.0	16 7	0.1	17.0
Turnips,	1.1	6.1	0.1	5.8
IV.—MANUFACTURING AND WASTE PRODUCTS, ETC.				
Sugar Beet Cake	1.8	24.6	0.2	13.9
Malt Sprouts	12.8	51.6	1.7	4.7
Wheat Bran, coarse	12.6	42.7	2.6	3.9
Rye Bran,	12.2	46.2	3.6	4.5
Linseed Cake,	24.8	27.5	8.9	2.0
Palm Nut Cake,	16.1	54.4	9.5	4.9
Cotton-seed Cake,	17 5	14 9	5.5	1.7
Cotton seed Cake discorticated	31.0	18.3	12.3	1.6
Flesh Meal	6[illegible].2	....	11.2	0.4

Suppose now that I wish to feed my oxen that are standing in the stable doing no work, on medium quality hay and oat straw, and add enough wheat bran to keep them in good store condition. By the above figures there will be contained in:

	Albuminoids.	*Carbo-hybrates.*	*Fats.*	*Total*
	lbs.	lbs.	lbs.	lbs.
6 pounds medium hay	0.32	2.5	0.06	2.88
12 pounds oat straw	0.17	4.8	0.08	5.05
2 pounds wheat bran	0 25	0.8	0.05	1.10
Whole daily ration	0.74	8.1	0.19	9.03
Standard ration	0.8	8.0	0.15	8.85

That is, 6 pounds of medium hay, 12 pounds oat straw, and 2 pounds wheat bran, will furnish just about the

quantities of digestible albuminoids, carbo-hydrates and fats, that the standard per day for 1,000 pounds, live weight, requires.

My friend and former assistant, Prof. W. H. Jordan, of the Maine Agricultural College, has made use of the feeding standards above given in calculating the following rations for various farm animals. It is not meant that just these proportions must be used. There are wide variations in the composition, digestibility, and flavor of the same feeding stuffs. So likewise the individual pecu liarities of the animals, their size, condition, varying capacities for digesting, and more especially, for their food, differ greatly. Hence the rations need to be adapted to particular cases. The important thing is to mix the foods on hand, or to be bought, so as to secure the best results at the lowest cost. These are simply examples of mixtures that contain the nutrients in about the proportions believed to be best adapted to the purpose. I cannot give what seems to me the right view of this system of calculating food rations, better than in the words of a shrewd and intelligent German farmer, who has had considerable experience in their use: "As indications of what is best, they are invaluable; to follow them blindly would be folly."

DAILY RATIONS FOR 1,000 POUNDS LIVE WEIGHT.

(A). MAINTENANCE. FODDER FOR FULL GROWN, LABOR-FREE OXEN.

lbs.	*No.* 1.
6	Med'm meadow hay
12	Oat straw
2	Wheat bran

lbs.	*No.* 2.
5	Clover hay, best
18½	Wheat straw
½	Linseed cake

lbs	*No.* 3.
6	Poor timothy
17	Corn stalks
4	Corn meal

lbs.	*No.* 4.
15	Oat straw
20	Potatoes
1	Cotton-seed meal

lbs.	*No.* 5.
10	Poor Timothy
20	Sugar beets
2	Corn meal

lbs.	*No.* 6.
6	Clover hay, best
15	Oat straw

(B) FODDER FOR OXEN AT MODERATE WORK.

lbs. *No.* 7.
20 Good meadow hay
6½ Corn meal

lbs. *No.* 8.
20 Medium timothy
2 Coarse bran
4 Corn meal

lbs. *No.* 9.
12 Good meadow hay
13 Oat straw
3 Linseed cake

lbs. *No.* 10.
12 Clover hay, best
10 Rye straw
22 Potatoes

lbs. *No.* 11.
12. Clover hay, good
10 Wheat straw
7 Wheat bran

lbs. *No.* 12.
10 Clover hay, best
14 Oat straw
20 Mangolds
1 Cotton-seed meal

(C) FODDER FOR OXEN AT SEVERE WORK.

lbs. *No.* 13.
20 Best meadow hay
10 Corn meal

lbs. *No.* 14.
17 Clover, good
3 Wheat bran
10. Corn meal

lbs. *No.* 15.
25 Medium meadow
3 Wheat bran hay
3 Linseed cake

(D) WINTER FODDER FOR MILCH COWS.

lbs. *No.* 16.
20 Best meadow hay
5 Wheat bran
3 Palm-nut meal

lbs. *No.* 17.
20 Good Clover
20 Beet pulp
2 Cotton-seed meal

lbs. *No.* 18.
17 Best meadow hay
16 Corn stalks
3 Wheat bran
2 Cotton seed meal

lbs. *No.* 19.
10 Clover hay, best
15 Poor timothy
20 Turnips
3½ Linseed cake

lbs. *No.* 20.
20 Hungarian hay
20 Mangolds
3 Wheat bran
2 Linseed cake

lbs. *No.* 21.
20 Clover hay, best
2½ Wheat bran
50 Turnips

lbs. *No.* 22.
10 Best meadow hay
15 Wheat straw
5 Wheat bran
3½ Cotton-seed meal

lbs. *No.* 23.
20 Clover hay, med'm.
30 Mangolds.
4 Malt sprouts

lbs. *No.* 24.
20 Clover hay, best
30 Turnips
6 Corn meal

FODDER FOR GROWING CATTLE, ONE TO TWO YEARS OLD.

lbs. *No.* 25.
15 Medium meadow hay
18 Rye straw
2 Cotton-seed meal

lbs. *No.* 26.
20 Oat straw
30 Turnips
5 Wheat bran
2 Cotton-seed meal

lbs. *No.* 27.
15 Medium meadow hay
20 Corn stalks
1¾ Meat scraps

lbs. *No.* 28
10 Good clover
10 Oat straw
8 Corn stalks
2 Cotton-seed meal

lbs. *No.* 29.
20 Poor meadow hay
20 Potatoes
1½ Dry ground fish

lbs. *No.* 30.
20 Good meadow hay
20 Mangolds
4 Coarse wheat bran

(G) FODDER FOR FATTENING CATTLE.

lbs. *No.* 31.
22 Clover hay, best
8 Corn meal

lbs. *No.* 32.
20 Medium meadow hay
10 Oat straw
30 Mangolds
3½ Cotton-seed meal

lbs. *No.* 33.
20 Good meadow hay
100 Pumpkins
3½ Cotton-seed meal

lbs. *No.* 34.
20 Best meadow hay
30 Sugar-beet pulp
2 Linseed cake

lbs. *No.* 35.
22 Best meadow hay
50 Turnips
5 Corn meal

lbs. *No.* 36.
15 Clover hay, best
10 Barley straw
40 Mangolds
3 Linseed cake

FODDER FOR SHEEP PRODUCING WOOL.

lbs. *No.* 37.
15 Clover hay, good
10 Poor hay
3 Oats

lbs. *No.* 38.
10 Medium hay
15 Bean straw
4 Corn

lbs.	*No.* 39.
20	Pea straw
20	Potatoes
2	Cotton-seed mea

lbs.	*No.* 40.
20	Oat straw
30	Mangolds
1½	Dried flesh

lbs.	*No.* 41.
10	Best clover
10	Barley straw
1½	Fish scrap

lbs.	*No.* 42.
20	Poor meadow hay
	Clover hay, best
4	Corn

MORE ABOUT FEEDING STUFFS AND FODDER RATIONS.

(By Prof. W. O. Atwater, of Wesleyan University, Middleton, Conn.)

There are too very important matters connected with the economical feeding of stock which the teachings of modern science explain, but which too few farmers understand, how to adapt the food most economically to the wants of the animal and the purpose for which it is fed, and how to feed so as to make the richest and best manure.

Either the concurrent testimony of the most advanced science and the most profitable practice is false, or the farmers, of our older States especially, must improve their methods of feeding to farm most successfully. For this they need especially to—1st: Produce better foods by better manuring and culture, and by more careful gathering and housing. 2d. Carefully save the poorer food and waste products, and feed them so as to utilize the large amount of nutriment they contain. 3d. Use a greater variety of feeding stuffs, and in proper mixtures. 4th. Use more nitrogenous foods—*i. e.*, (*a*) Raise more clover, and, where circumstances will allow, beans, peas, lucern, and leguminous plants. (*b*) Buy cotton-seed meal, linseed meal, palm-nut meal, bran, and other nitrogenous foods. (*c*) mix these rich materials with poor hay, straw, cornstalks, and the like, in such proportions as are fitted to the wants of the animals and the purposes for which they are fed. This will bring excellent fodder and rich manure at at very low cost. To see why these facts are so, note the table on next page.

Nutritive Ingredients of Foods and Feeding Standards.

FOODS AND FEEDING STANDARDS.	Digestible Food Ingredients.				Nutritive Ratio.
	Albuminoids.	Carbo-hydrates, including fibre.	Fat.	Total.	
	p.c.	p.c.	p.c	p.c.	as to
Feeding Stuffs.					
I.—HAY.					
Meadow Hay, poor	3.4	34.9	0.5	38.8	10.6
" " medium	5.4	41.0	1.0	47.4	8.0
" " very good	7.4	41.7	1.3	50.4	6.1
Red Clover, poor	5.7	37.9	1.0	44.6	7.1
" " medium	7 0	38.1	1.2	46.3	5.9
" " very good	8.5	38.2	1.7	48.4	5.0
II.—STRAW.					
Winter Wheat	0.8	35.6	0.4	36.8	45.8
Winter Rye	0.8	36.5	0.4	37.7	46.9
Oat	1.4	40.1	0.7	42.2	29.9
Corn Stalks	1.1	37.0	0.3	38 4	34.4
III.—ROOTS AND TUBERS.					
Potatoes (Irish)	1.1	22.8	0.2	24.1	21.6
Sugar Beets	1.0	16.7	0.1	17 8	17.0
Turnips	1.1	6.1	0.1	7.3	5.8
IV.—MANUFACTURING AND WASTE PRODUCTS, ETC.					
Sugar Beet Cake	1.8	24.6	0.2	26 6	13.9
Malt Sprouts	12.8	51.6	1.7	66.1	4.7
Wheat Bran, coarse	12.6	42.7	2.6	57.9	3.9
Rye Bran	22.2	46.2	3.6	62.0	4.5
Linseed Cake	24.8	27.5	8.9	61.2	2.0
Palm-Nut Meal	16.1	55.4	9.5	81.0	4.9
Cotton-seed Cake	17.5	14.9	5.5	37.9	1.7
Cotton-seed Meal, decorticated	31.0	18.3	12.3	61.6	1.6
Flesh Meal	69.2	...	11.2	80.4	0.4
Dry Ground Fish	44.6	...	8.6	53.2	0.5
Feeding Standard.					
PER DAY AND PER 1,000 LBS. LIVE WEIGHT.	lbs.	lbs.	lbs.	lbs.	lbs.
1. Oxen at rest in stall	0.7	8.0	0.15	8.85	12.
2. Wool Sheep, coarser breeds	1.2	10.3	0.20	11.70	8.
" " finer breeds	1.5	11.4	0.25	13.15	8.
3. Oxen, moderately worked	1.6	11.3	0.30	13.20	7.5
" heavily worked	2.4	13.2	0.50	16.10	6.
4. Horses, moderately worked	1.8	11.2	0.60	13.60	7.
" heavily worked	2.8	13.4	0.80	17.00	5.5
5. Milch Cows	2.5	12.5	0.40	15.40	5.4
6. Fattening Oxen, first period	2.5	15.0	0.50	18.00	6.5
" " second period	3.0	14.8	0.70	18.50	5.5
" " third period	2.7	14.8	0.60	18.10	6.0

RICH VS. POOR FOODS—PROPORTIONS OF DIGESTIBLE ALBUMINOIDS, CARBO-HYDRATES, AND FATS.

Now let us take a poor food, as oat-straw, and compare it with good hay. One hundred pounds of "very good" hay contains about 50 lbs. of digestible material, while the same amount of oat-straw furnishes some 42 lbs. At this rate, 120 lbs. of oat-straw would supply as much nutritive material as 100 lbs. of first quality upland hay. But it would not be worth as much for fodder. Why the straw is worth less appears when we compare the amounts of the different ingredients. The 100 lbs. of hay, with its 50 lbs. of digestible matter, furnishes 7.4 lbs. of albuminoids against only 1.4 lbs. in the straw. So likewise the hay contains 1.3 lbs. of fats, the straw only 0.7 lbs. But when we come to the carbo-hydrates we find just about the same amounts in both. The straw lacks albuminoids and fats, and these are the most valuable ingredients of the food. The albuminoids make all the nitrogenous tissues of the body, the lean meat (muscle), the gristle, skin, etc., all the albumen and caseine of the milk, and part of the fat of the body and of the milk (butter), besides sharing in the production of animal heat and muscular force. The fats of the food are transformed into fats in the body, and share in the production of heat and force. They can not be made into muscle or other nitrogenous tissue, however, because they have no nitrogen. At least, the present evidence is entirely in this direction. The carbo-hydrates do not make nitrogenous tissue in the body. They are probably transformed into fats, but only to slight extent. They serve for fuel, and seem to aid in producing muscular force. They thus do a work of their own, which, if it were not for them, would be left for the costlier albuminoids and fats. So even if the carbo-hydrates are not made into flesh, fat, butter and caseine themselves, they doubtless do what amounts in practice to the same thing by saving the other ingredients to be used for these pur-

poses. Starch and sugar are carbo-hydrates, but they are at the same time valuable foods.

The reason for the inferior worth of the straw may be seen from another standpoint in the last column of the table: "*Nutritive Ratio.*" The "very good" hay has 1 lb. albuminoids for every 6 lbs. carbo-hydrates (1 lb. fat being reckoned equal to 2 1-2 lbs. carbo-hydrates), while the straw has one pound of albuminoids to 0 lbs. of carbo-hydrates. According to the feeding standards, for a milch cow a ration with 1 lb. albuminoids to 5.4 carbo-hydrates will be appropriate, while an ox at rest in the stall will do well with only 1 lb. albuminoids to 12 lbs. carbo-hydrates. The best hay will serve well for making milk, while the straw has not enough of the albuminoids and fats to make it a proper food for even store cattle. There is a great difference between

GOOD AND POOR HAY.

Upland hay cut during the period from early blossom to full blossom is easily digestible, and has a good per centage of albuminoids. But as it grows older the proportion of nitrogen decreases, and that of woody fibre grows larger, the hay becomes less digestible, the digested materi is poorer because it lacks albuminoids, and finally the old hay is not so palatable. For all these reasons the late cut hay is worth far less for feeding. Grass grown on rich soil is richer in albuminoids than on poor soil. Marsh and bog hays lack albuminoids and fats. Clover, timothy, red-top, blue-grass, and the like, grown on good soil, cut early and well cured and housed, make excellent fodder. Poorly manured, cut late, and badly cured, they are very poor stuff. Much of the hay that lies in the barns all through the country is very little better than straw.

THE WAY TO USE THESE POOR FOODS

economically then must be to supply what they lack. To make boots of neck or split leather, or to throw the poor

leather away, would be bad economy. With good leather for the parts where the wear comes, the poor leather may be used for backs and linings, and thus be made valuable. So we may feed straw, corn-stalks, and over-ripe or marsh hay to advantage, provided we put other foods with them to supply the albuminoids and fats. Now note in the table the figures for clover, bran, beans, peas, oil-cake, meat scraps and dry ground fish. They have very little carbo-hydrates, but are rich in albuminoids and fats.

COTTON-SEED MEAL, LINSEED MEAL, PALM-NUT MEAL, AND BRAN

are foods whose value farmers in this country are just beginning to appreciate. European farmers long since found out how much they are worth, and thousands of tons of American oil-cake and meal have been carried across the Atlantic to enrich English, French and German foods and soils. The time has come when we must keep them at home if we are going to redeem our farming. The great value of these foods is due to two facts: 1. They supply the albuminoids and fats in which poor hay, straw and the like are lacking. 2. They make rich manure. How they may be used with poor foods to make good rations at small cost, is illustrated in fodder rations. Chemistry indicates, experiments prove, and experience corroborates that foods, as late cut hay, marsh hay, straw, corn-stalks, etc., can be utilized and made very valuable by feeding with them nitrogenous foods such as oil-meal, bran, and clover-hay, to supply what they lack. It is proved that such mixtures make the very best rations, and still urther that this is one of the cheapest ways to get good manure.

DRIED BLOOD, MEAT SCRAP AND FISH AS FOD FOR STOOCK·

Years ago, oil-cake used to be employed as a fertilizer. Chemistry said it ought to be first fed to stock, that it has a high nutritive value, that in going through the animal machine but little of the valuable material is consumed,

and that the residue is worth more for manure than before. Experience proved that all this is true, and now nobody would think of using linseed cake or cotton-seed meal for manure. Of late, immense quantities of slaughter-house refuse, dried blood, dried intestines, and the like, and still larger quantities of the refuse left after the extraction of oil from fish, are being prepared and used as fertilizers. These ought, like the oil-cake, to be first utilized for food. The idea, though novel to most farmers, is an old one, and has been put into successful practice in many places. In its favor is the unanimous testimony of chemical composition, careful experiments, and the experience of farmers who have used the materials with success. Against it are, the difficulty of preparing wholesome materials, which can be overcome, and the prejudice that only time and trial are needed to dispel.

THE MANURIAL VALUES OF NITROGENOUS FOODS

is a matter worthy the thoughtful consideration of farmers. Nitrogen, Phosphoric Acid, and Potash are the most valuable ingredients of manure. Farmers buy them in the better kinds of commercial fertilizers at the rate of from fifteen to thirty cents per pound for nitrogen, six to eighteen cents per pound for phosphoric acid, and three and a half to nine cents per pound for potash. Cotton-seed, linseed, and palm-nut meals, bran, dried blood, meat-scrap, and fish, are rich in these ingredients. Mr. Lawes has made some calculations of the money values of the manures produced from different foods. This he does by assuming that certain percentages of nitrogen, phosphoric acid, and potash are consumed and lost, that the rest go into the manure, and that they have there about the same value, pound for pound, as similar ones in commercial fertilizers in which their value is pretty well settled. I give Mr. Lawes' estimates of the value of manure from a number of foods, and with them the feeding values, as estimated by Wolff, per table 1;

	FEEDING VALUE. *Wolff*	MANURIAL VALUE. *Lawes.*
Cotton-seed Cake	$41 40 per ton	$27 86 per ton
Linseed Cake	34 40 per ton	19 72 per ton
Beans	15 20 per ton	15 73 per ton
Wheat Bran	20 80 per ton	24 59 per ton
Clover Hay	14 00 per ton	9 64 per ton
Indian Meal	22 20 per ton	6 64 per ton
Meadow Hay	12 80 per ton	6 43 per ton
Oat Straw	9 00 per ton	2 90 per ton
Potatoes	5 80 per ton	1 50 per ton
Turnips	2 20 per ton	86 per ton
Meat Scrap	55 60 per ton	——
Dry Ground Fish	46 00 per ton	——

Mr. Lawes rates the ingredients pretty high, and probably allows too little for loss in passing through the animal and in the keeping and handling of the manure. Wolff's rates doubtless require modification for our markets, and the actual worth of the nitrogenous food stuffs would come up to the valuations only where they are properly used with other foods.

In addition to the necessity for an abundance of wholesome food having in proper ratio the albuminoids and carbo-hydrates milch cows should have free access to

AN ABUNDANT SUPPLY OF PURE WATER.

Analyses of milk of cows show that it contains, on an average, 86 per cent. of water. This being true an abundant supply of water is necessary to a liberal yield of milk. and *pure water* is essential to the production of good milk, It has been found, however, that food containing an excess of water, or inducing the consumption of large quantities of water by cows, will cause the secretion of milk to be poor in quality. Cows should not be compelled to walk a long distance for their supply of water, nor should they be required to labor over a large area to fill themselves with grass. Moderate exercise is no doubt beneficial, but when excessive, it is at the expense of production of milk or beef. The pasturage should be such that they can fill

themselves in a few hours and then lie quietly in the shade and ruminate. Some object to

SHADE IN PASTURES

on the ground that it offers an inducement to the cattle to idle when they would otherwise be feeding, but no experienced stock-breeder or dairyman would, from any such contracted view, deprive his stock of the comfort and protection of shade during our long summer days. So far from removing the shade from pastures, clumps of trees should be left in pastures, not only for the comfort of the stock but for the pleasing effect upon the landscape.

A cow subjected to pain, worry or discomfort of any kind, cannot yield a full supply of milk of good quality.

DRYING OFF BEFORE CALVING.

Cows should be dried off a month before bringing another calf, since yielding milk and sustaining a large fœtus, at the same time severely taxes their vital powers. A month should be given in which to recuperate from the tax of milk production, and in which to accumulate flesh and strength preparatory to a new period of usefulness.

Care should be taken in drying off to draw all of the milk from the udder at intervals, commencing with once in twenty-four hours and increasing the intervals until secretion of milk ceases. If a portion of the milk is left in the udder, it becomes a source of irritation and often results in the loss of a portion of the bag.

FEEDING WHILE DRY.

Many farmers make the mistake of neglecting their cows while dry, allowing them to grow poor before coming in, and depending upon feeding up after calving. This is mistaken policy which results in loss to the owner of the cows. It should be remembered that there is a severe draught upon the system to sustain the growing fœtus, and while under good treatment, all animals have a tendency to fatten during pregnancy, this tendency needs to be encouraged by liberal feeding or abundant pasturage.

Good feeding before coming in so that the cows come to the pail in good condition, not only insures a good flow of milk as soon as the calf is dropped, but actually saves food in the end. Cows should be well fed while dry, and kept in good, thriving condition, but not made fat.

They cannot be expected to yield a full flow of milk and lay on fat at the same time. If in good condition when they come in, all the food given afterwards, except that required to maintain the thrifty condition already acquired, will be devoted to milk production.

Salt should at all times be accessible to cattle so that they may satisfy their cravings for it at pleasure. A block of rock salt should be placed in a box in each stall, or at some convenient point in the pasture, where they may go and satisfy their appetites at will. This is better than giving it at stated periods, or mixing it with their food. If given at stated periods, they are apt to take too much at one time; or, in their greed after it, to fight and injure each other. If given in the food there is not only risk of their getting too much and injuring themselves by drinking too much water, or of rejecting their food on account of the salt.

If too much salt is taken by cows giving milk, it will either result in their taking too much water and thereby injuring their health and impoverishing their milk; or, if relief is not found by access to water, in are duction of the flow of milk.

SOILING

Or cutting food and feeding cattle in inclosed lots or in stalls, may be profitably resorted to where a large number of cattle must be kept on a small area.

The advantages of soiling over grazing are:

1. Economy of land. A given area will support more cattle if sown or planted in a succession of forage crops which are cut and fed to cattle either in their stalls or in inclosed lots.

2. A larger amount of manure of better quality is saved, and if proper arrangements are made, the liquid manure, the most valuable part, may be saved, and thus the fertility of the farm increased.

3. Having a uniform supply of good, succulent food, given at regular intervals, without waste of vital force by unnecessary exercise, cattle keep in better condition when soil-fed than when allowed to run at pasture.

4. They acquire habits of quietude, receive good and regular attention, and choice and abundant food, and hence yield a greater flow of milk, untainted by noxious weeds and uncontaminated by stagnant, impure water.

5. If abundant provision is made for a full succession of soiling crops, the cows receive a uniform supply of food, regardless of the weather, and do not fall off in their milk as when pastures fail.

6. The owner has absolute control over his herd and may by proper selection and judicious mating improve his stock.

7. The animals are less exposed to the influence of sudden changes of temperature and hence less liable to become diseased.

A SUMMARY.

The main points of importance in the management of milch cows may then be summarized as follows:

1. Select good cows as the first requisite for success.

2. Bestow upon them and their offspring kind and gentle treatment.

3. Feed liberally and regularly, or supply them with good pastures.

4. Provide sufficient shelters to protect them from inclement weather.

5. Provide an abundant supply of pure water.

6. Feed and milk regularly and punctually at the same hours daily.

7. Keep their stalls or milking pens scrupulously clean and free from all offensive odors.

8. Milk quietly, rapidly and gently and draw the strippings thoroughly, as they are from five to fifteen times as rich as the first milk drawn.

9. If the calf is nursed by the cow, allow it to draw the first milk from each teat and not all from any.

10. If keeping a regular dairy, wean the calves when not more than three days old.

11. Keep no more cattle than can be well fed and cared for, and let these be of good quality.

12. Grade up common cattle by the use of thoroughbred bulls of the kind best suited to the purposes for which the cows are kept. If for butter, the Jerseys; if for milk, one of the deep-milking breeds; if for combination of butter, milk and beef, the Devons.

13. Give personal supervision to feeding and milking as far as practicable.

Of course much of the above is not applicable in those sections of the State in which cattle roam *ad libitum* in the pine forests or over the mountains, and receive little more attention than to collect them once a year for the purpose of marking the calves.

CHAPTER XI.

SELECTION OF MILCH COWS—THE GUENON SYSTEM ILLUSTRATED.

The foundation of success in dairying is involved in the judicious selection of the cows. The dairyman who is a skillful judge of cows in reference to their milk-producing capacity will have such an advantage over the unskilful as almost to preclude the idea of competition.

The importance, therefore, of conveying clear and accurate information on this subject will be appreciated by the reader, and an effort will be made in this chapter to enumerate, as concisely as possible, the principal points indicative of dairy qualities in cows.

In the space allotted to a treatise of this character, it will be impracticable to enter into minute details involving the distinctive peculiarities of the different breeds. The reader, however, may make the necessary allowance for variations arising from the characteristics of different breeds by reference to the chapter in which the different breeds and their characteristics are described.

The remarks in this chapter will be based upon the presumption that the dairy stock are supplied with abundant nutritious food and receive proper attention as to shelter, milking and gentleness of handling.

The results which might reasonably be expected from the character marks of animals will of course be modified by neglect in any of these important particulars.

As a rule, cows, to give promise of profitable yield at the pail, must have a general feminine appearance as regards form compared with the masculine appearance of the other sex.

The dairy cow should have a small head, well set upon a tapering neck. With the exception of the Devons, the horns should be small, with rather a drooping tendency. Viewed in front, there should be a gradual taper from shoulders to hips—ribs well arched, giving full play for vigorous vital organs.

A side view should present the same wedge-shape, rising from the neck to the rump, and descending from the brisket to the udder, with ample stomach and liberal capacity for the consumption of food. The udder should be large and attached well forward under the belly. The milk veins should be large, irregular in shape and knotty, entering the body though large holes. All the better if these veins ramify over the rear of the udder and perceptably over the perineum. The skin should be loose and pliant, and covered with soft, fine hair. These points are taken in by the practiced eye at a glance, and suggest good milking properties. If added to these, we find a capacious escutcheon of upward growing hair extending well up the perineum to the vulva, and out on the lower part of the thighs, the other marks are well sustained. If on closer examination the upward growing hair, which marks the extent of the escutcheon, is found to be short and soft, and if on passing the finger nails downward over it a yellow, oily dandruff is discovered, and if the area of the escutcheon is uninterrupted, except by two bunches of downward growing, silky hair on the rear of the udder, the cow may be entered as first-class, so far as quantity of milk and continuance at the pail are concerned. If, in addition to these points, she shows a rich, yellow skin, with the oily dandruff on the escutcheon, milk rich in butter may be expected.

THE ESCUTCHEON—WHAT IS IT?

The escutcheon on cattle is that portion of the twist or space between the thighs which is covered with upward growing hair, which is usually darker and softer than that

adjacent on the thighs, which grows downward. This, in cows, commences on the front or lower part of the udder, and extends more or less out upon the thighs above the hock, and up over the perineum or space between the upper part of the thighs, varying in form and extent on different individuals.

Mr. Willis P. Hazard, the Secretary of the Pennsylvania Guenon Commission, in his book entitled "How to Select Cows, or the Guenon System Simplified, Explained and Practically Applied," says: "The hair of the escutcheon should be short, soft and fine, and the skin very soft, like a kid-glove, thin and oleaginous; and if the cow gives good, rich milk, this skin will be of a rich, golden or nankeen hue. Often, when you handle a skin of this character, the hand will feel oily, and soiled with dandruff."

THE SHAPE OF THE ESCUTCHEON.

"The escutcheon varies in shape, and Guenon named his ten classes from their shapes.

"The first class he called Flandrine, or Flanders, because it is the best, and he named it from the best cows he knew, those from Flanders or the Flemish breed, and they had more of this shaped escutcheon than any other breed; a quiet but sure proof of the truth of his system.

"The second class he called Flandrine a gauche, because although it had the Flanders shape, it was on the left flank; he called it, therefore, the Left Flanders.

"The third class are the Lisiere, or the Selvage, from its resembling in appearance a selvage, or binding of a piece of cloth.

"The fourth class are the Courbe-Ligne, or the Curve-line, because their escutcheon is lozenge-shaped, formed by a curved line which sides to the right and left, and rises to about five or six centimeters (two and a half or three inches) from the vulva.

"The fifth class he denominated Bicorne, or the Bicorn cow, because the upper part of the escutcheon forks in two horns.

"The sixth class, Double-Lisiere, or Double-Selvage, has an entirely arbitrary name, and it is an odd freak of nature.

"The seventh class he called the Poitevine, or Demijohn, from a fancied resemblance to some kinds of demijohns.

"The eighth class is Equerrine, or Square escutcheon, as it is square at the upward part.

"The ninth class is the Limousine, as it was on a cow from that Province that Guenon first saw this shaped escutcheon.

"The tenth class is called Carresine, or Horizontal, because the upward part of the escutcheon is cut off squarely by a horizontal line."

In each class Guenon grades the escutcheons down from the best to very inferior. These he calls orders. For practical purposes, it is not necessary to follow him in his six orders, as cows with escutcheons ranking below the fourth order are rarely worthy of consideration. There are, however, escutcheons well worthy the careful consideration of both breeders and purchasers of cows, since they are apt to mislead the casual observer. These are what Guenon calls *Batard*, which has been rendered into English by his translators "Bastards," though the word does not clearly convey the idea intended to be represented.

The Bastards in each class have finely developed escutcheons, and soon after calving give a good flow of milk, but rapidly decline in yield when impregnated.

An illustration of the escutcheon of the first order in each class is given as a guide to those who desire to study the system, the cuts having been copied from Mr. Willis P. Hazard's book entitled "How to Select Cows." For the protection of those who wish to purchase cows or

select heifers for dairy purposes, the Bastard of the first class is illustrated and the others described.

Those who wish to study the system more in detail are advised to purchase "A Treatise on Milch Cows," by M. Francis Guenon, or "How to Select Cows, or the Guenon System Simplified," etc., by Willis P. Hazard, Westchester, Pennsylvania.

HOW TO STUDY THE SYSTEM.

The first thing to be done is to fix the *form* of the different classes of escutcheon well in the mind, associating with it the number of gallons of milk a cow of each class, of good size, well-fed and cared for should give, remembering that a large animal, other things being equal, will generally yield more milk than a small one, and keeping in view also the variations due to different breeds.

Then, the distinguishing marks of the bastard cows of the various classes must be studied. These will be explained in connection with the illustrations.

"This," says Hazzard, "must be supplemented by the careful examination of the hair and the skin of the escutcheon and the udder; of the hair, whether it is short, fine, soft and furry; of the skin, whether it is soft and close-grained, like a kid glove, thin, oleaginous and yellow or golden. For, if the hair is harsh and long, particularly on the back part of the udder, it will shorten the time of giving milk and indicates a poorer quality. The more oily or greasy the feeling of the skin of the udder and perineum is, the more it indicates good quality and richness of milk, for the oil or fat is there, showing it is the nature of that animal to give butyraceous milk. So, for the color of the skin, if it is golden it is indicative of rich milk, and the majority think it will make a finer-colored butter. There is one point more in judging by the escutcheon, and that is its size and position, and the general rule is, the higher up it is on the thighs and the broader

it is on the thighs, together with the higher and broader it is on the perineum, even up to the vulva, then the better it is. Then, remember the escutcheon has two principal parts, called the thigh escutcheon and the vertical escutcheon; the thigh escutcheon extends over the udder and the thighs, and the vertical is over the perineum or that part of the posterior which extends from the udder up toward the tail, under and often around the vulva.

"If the thigh escutcheon is high and broad, therefore very large, and extends far outward on-to the thighs, it indicates a large flow of milk. If the vertical or upper part is broad and smooth, it indicates a prolonged flow of milk.

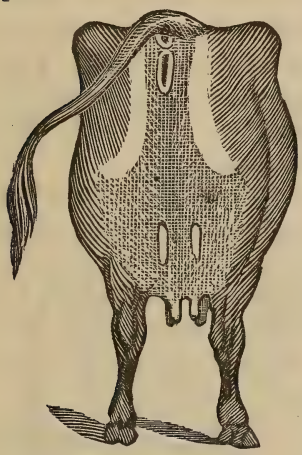
"If the thigh or lower portion of the escutcheon is narrow, the flow will be proportionately small. If the vertical or upper part is narrow and irregular, it is unfavorable to a prolonged flow."

It should be remembered that the size and form of the escutcheon indicate the quantity of milk a cow will give; the color, oiliness and softness of the skin and the softness and furry nature of the hair, with the presence of oily dandruff on the escutcheon, are evidences of good quality. A white, dry, harsh skin, with long, coarse, bristly hair, indicate poor quality of milk.

Bulls show the escutcheon in all its forms, and, though smaller in extent, should be considered in the selection of an animal intended for the sire of dairy stock.

The outline of the escutcheon may be seen on calves only a few weeks old, and has long been used by breeders of dairy stock as a guide in selecting heifers to be reserved for dairy purposes. This is one of the most important applications made of the Guenon system, since it relieves the breeder of much expense and disappointment by obviating the necessity of waiting till the heifers drop their calves to decide which will prove profitable for the dairy. Besides, a heifer is more valuable for beef before having the first calf than she ever is afterward.

A gentleman in Virginia, who has selected his heifers for breeding purposes with reference mainly to the indications of the escutcheon, has never, in twenty-five years, had to discard one so selected after a practical test at the pail.



First-class—FLANDERS COW.
First Order.

Cows with this escutcheon are very rare. The first order of this class, if of good size, give twenty quarts when in full milk. The engraving needs little explanation. The white spots on the udder represent what are called ovals. They are small hunches of silky downward-growing hair in the midst of the escutcheon.

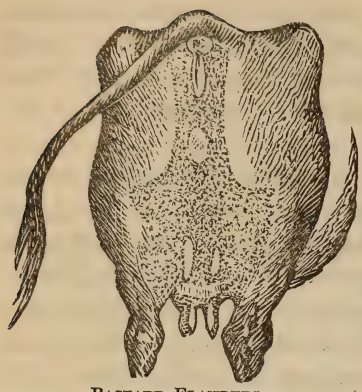
These cows never go dry.

The second order has a smaller escutcheon than the first, with only one oval, and has a tuft of downward-growing hair on the right side of the vulva from two to three inches long and from one to two inches broad.

They yield eighteen quarts of milk for eight months.

The third order has a still smaller escutcheon. They have a tuft of downward-growing hair extending around and below the vulva. They are generally without the oval. They yield sixteen quarts of milk, and continue at the pail six months.

In the fourth order the escutcheon is still smaller and less regular in shape, and has a strip of downward-growing hair below the vulva, extending down five or six inches. Another peculiarity of this order is a half oval on the right thigh, extending into and interrupting the thigh escutcheon, which is lower down and much smaller than the other orders.

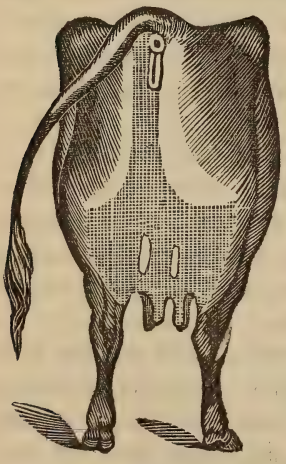


BASTARD FLANDERS.

There are two bastard marks of the Flanders cow:

1. A tuft of descending hair in the middle of the perineum, varying in size, usually about two inches wide and three long. The larger this tuft the sooner the cow will fail in her milk. All do no have it.

2. The interference of the ascending and descending hair on the edge of the escutcheon, giving it a bristling, bearded appearance, is another indication of bastardy. In every other respect the escutcheons of bastards of the Flanders cows are like those of the first order. They even have the ovals well developed.



Second-class—LEFT FLANDERS.
First Order.

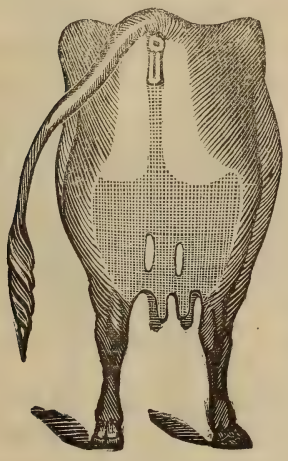
The escutcheon of cows of this class is similar to that of the first, except that the vertical escutcheon is entirely on the left of the vulva, and consequently the right thigh escutcheon larger than the left. They yield eighteen quarts and milk eight months.

The second order has a smaller escutcheon, with only one oval, and a small tuft of downward growing hair on the left of the vulva. They yield sixteen quarts and milk seven months.

The third order has a still smaller escutcheon, with a larger tuft on the left of the vulva. They yield fourteen quarts and milk six months.

Those of the fourth order have still smaller and more irregular escutcheons, the tuft of downward growing hair being longer. There are also two invasions of the thigh escutcheon—one on each side—a curved invasion on the right and an angular one on the left. They give ten quarts and continue at the pail five months.

The bastard of this class has the full escutcheon of the first order, as seen in the engraving, but have a large tuft (usually of coarse hair) on the right of the vulva.



Third-class—SELVAGE.
First Order.

This escutcheon extends well out on the thighs, terminating in an acute angle, thence descending to the vertical escutcheon, which is narrow and extends to the vulva. The engraving represents the first order. The cows of this order have yellow skins and soft and oily escutcheons. They give in full milk nineteen quarts and milk from eight to nine months.

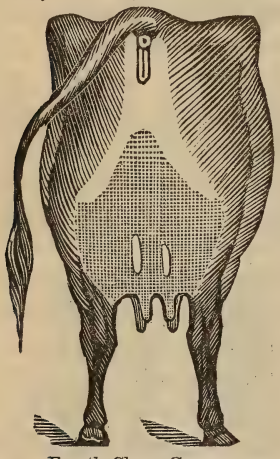
"The second order is similar to the first, only of reduced size. It has a tuft to the left of the vulva, and only one oval on the udder on the left side. The hair of the escutcheon is generally more glossy than that around it. Cows of the second order give seventeen quarts and milk seven months.

"The third order escutcheon curves downward on each side of the vertical mirror, which rises narrowing to a point at the vulva. To the right and left of the vulva are tufts, the one on the left being the longest. On the left of the udder is sometimes an oval. Cows of the third order give fifteen quarts and milk six months.

"The escutcheon of the fourth order is of similar shape, but still smaller; but the tuft on the left of the vulva is

much larger than on the right, and there is no oval on the udder. Cows of the fourth order give twelve quarts and milk five months."—Hazard.

The bastard of the third class has a large tuft on each side of the vulva. The rapidity with which cows having this mark decline in milk will vary with the character of the hair on these tufts and the surface covered by them. The finer the hair and smaller the tufts the longer the cow will give milk. The balance of the escutcheon resembles very closely that of the first order of the third class.



Fourth Class—CURVELINE. First Order.

"The Curveline cows are very plenty and are of a very good grade, approaching the first-class. The escutcheon is broader than the last two classes in the upper part. Their skin is of delicate texture and nankeen shade of color on the escutcheon. The higher and broader the curved line rises toward the vulva, which it never reaches, the better it is. There are two ovals on the udder. Cows of the first order of the fourth class give nineteen quarts and milk eight months, and sometimes up to their next calf."—Hazard.

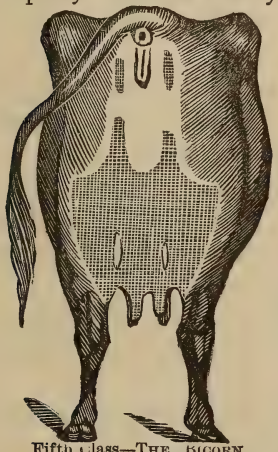
Those of the second order have smaller escutcheons of the same form as the first, except that there is a narrow tuft on the left side of the vulva. They give about seventeen quarts and milk about seven months.

The third order has still smaller escutcheons with tufts on each side of the vulva, that on the left longer than the one on the right; they give fifteen quarts and milk six months.

The fourth order have still smaller escutcheons with

larger and longer tufts by the vulva. They give twelve quarts and milk five months.

The Bastards of this class have escutcheons similar to the first order, but have large tufts on each side of the vulva. The rapidity with which they will decline in milk will depend on the size and shape and the character of the hair on these tufts. If the tufts are large and pointed and have coarse, bristly hair, they will decline very rapidly as soon as they are impregnated.



Fifth Class—The Bicorn. First Order.

This class is not so common as the last, nor do the cows having this escutcheon yield as much milk as those of the fourth class. The illustration explains itself. Cows of the first order of this class yield seventeen quarts and milk eight months.

The second order have similar escutcheons to the first, but smaller, with only one oval on the left of the udder. The left horn of the escutcheon is larger than the right. They give fifteen quarts and milk seven months.

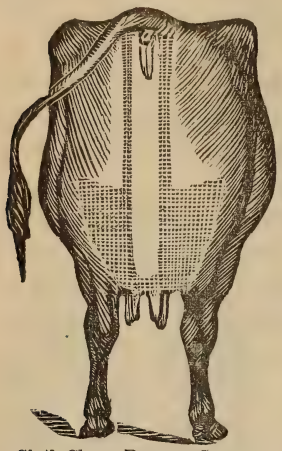
The third order is still smaller and has a half oval on the right thigh escutcheon which reduces its size. They give thirteen quarts and milk six months.

In the fourth order the escutcheon is not only much smaller, but has an angular invasion of the thigh escutcheon on the right. They give ten quarts and milk five months.

All the cows of this class have the tufts by the vulva, which increase in extent from the first order to the fourth, that on the left being longer than that on the right.

The Bastard has the tufts by the vulva much enlarged

and covered with coarse hair. In other respects the escutcheon of the bastards is similar to that of the first order.



Sixth Class—Double Selvage.
First Order.

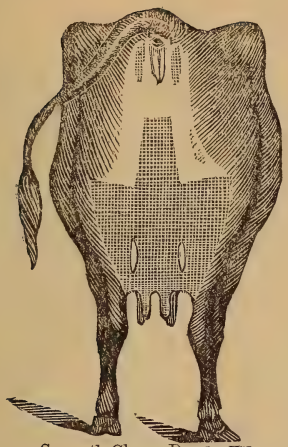
The cows of the first order of this class have a strip of descending hair reaching from the sides of the vulva to the lower part of the udder. This strip of descending hair is bordered on each side by bands of upward growing hair. As in other classes the cows of the first order of this class have a fine yellow skin over the region of the escutcheon which is covered with soft, silky hair. They give eighteen quarts and milk eight months.

In the second order the central strip of the vertical escutcheon terminates higher upon the bag, and the escutcheon is smaller than the first.

In the third order the descending belt terminates at the upper part of the udder and the escutcheon is very much smaller. The cows of this order yield fourteen quarts and milk six months.

In the fourth order the side lines of the vertical escutcheon terminates before reaching the vulva, in coarse, feathery looking hair. The outlines of the thigh escutcheon are also irregular and in size small. Cows of this order yield ten quarts and milk five months.

The Bastards of this class differ from the first only in the enlargement of the prongs of the vertical escutcheon on each side of the vulva.



Seventh Class—DEMIJOHN.
First Order.

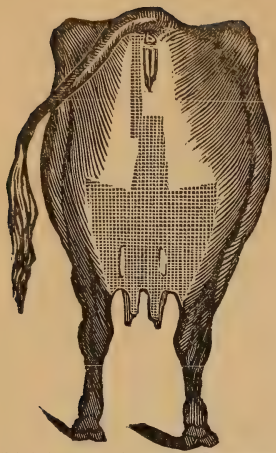
The first order of this class has the yellow color of the skin, fine hair and oily dandruff on the escutcheon indicative of good milk. The thigh escutcheon does not rise so high as in the first orders of the classes already described. Cows of this order yield seventeen quarts and remain at the pail eight months.

In the second order the escutcheon is smaller and lower down. It has one oval on the left, and the tufts by the vulva. Cows of this order yield fifteen quarts and milk seven months.

In the third order the escutcheon is still smaller, and instead of running to a point on the thighs curves down from the vertical portion, which is shorter than in the second order, the tufts by the vulva are longer than in the first and second orders. Cows of this order yield thirteen quarts and continue at the pail six months.

In the fourth order the escutcheon is still smaller and more irregular, sometimes having a triangular invasion of the thigh escutcheon on the right side. The tufts are not well developed and the hair coarse and bristly. Cows of this order yield ten quarts and milk five months.

Bastards of this class have an escutcheon similar to that of the first order except that they have the large tufts by the vulva.



Eighth Class--Square Escutcheon. First Order.

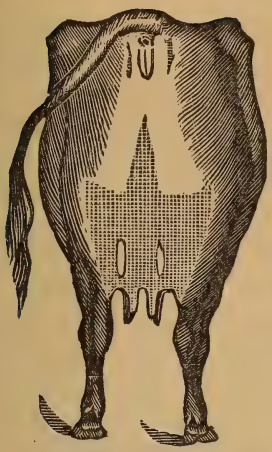
This escutcheon resembles very closely that of the seventh class Demijohn—the principal difference being found in the vertical escutcheon which turns squarely off to the left, ascending in a narrow strip to the left of the vulva. The color of the skin is good and the hair short and fine. The finer the hair the more oily the dandruff and more nearly the square approaches the vulva the better the cow. Cows of this order give seventeen quarts and continue eight months.

The second order is similar to the first, but smaller and curved on the thighs. There is a small tuft on the right of the vulva, and two ovals on the udder. Cows of this order should yield thirteen quarts and continue seven months.

In the third order the escutcheon is still smaller, has one oval, and the tuft on the right of the vulva is larger and covered with coarse hair. Cows of this order yield thirteen quarts and milk six months.

In the fourth order the escutcheon is very much smaller and irregular having an angular invasion on the right thigh, and bristly hair on the vertical portion. Cows of this order yield ten quarts and milk only five months.

The bastards of the eighth class have escutcheons similar to those of the first order, but have a large tuft of coarse hair on the right of the vulva and an enlargement of the vertical escutcheon of similar character on the left.



Ninth Class—Limousine. First Order.

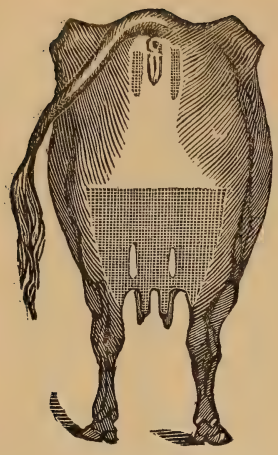
The peculiarity of the escutcheons of this class is the termination of the vertical portion in a sharp point below the vulva. It has the good features of other first orders. Cows of this order give fifteen quarts and continue at the pail eight months.

The second order differs from the first in being smaller in extent, terminating farther below the vulva, in having the points of the thigh escutcheon rounded and the tufts by the vulva longer. There is one oval on the udder. In this order thirteen quarts may be expected and a continuance of seven months.

The third order is still smaller, the thigh portion curved downward from the vertical and the tufts by the vulva longer. Cows of this order yield ten quarts and milk six months.

The fourth order is still smaller than the third, the tuft by the vulva covered with bristly hair and the left one much longer than the right. Cows of this order yield only eight quarts and milk but five months.

Bastards of this class have escutcheons similar in every respect to those of the first order, but have large tufts of bristly hair on both sides of the vulva.



Tenth Class—HORIZONTAL.
First Order.

Cows of this order have the characteristics of the escutcheons of other first orders, but have no vertical escutcheons as shown in the illustration. They yield only thirteen quarts and milk eight months.

In the second order the escutcheon is smaller than the first, the thigh portion larger on the left than on the right. The vulva tufts are larger. There is only one oval. Cows of this order yield only ten quarts and continue seven months.

In the third order the escutcheon is lower down, smaller and more irregular in shape with a triangular invasion by the descending hair on the right. The vulva tufts are also larger with bristly hair.

The escutcheon of the fourth order of this class is very small and defective having a triangular invasion of the thigh portion on the right and one of an inward curve on the left. The tufts are large and composed of coarse, bristly hair.

The bastards of this class have good large escutcheons similar to the first order but having the vulva tufts well defined.

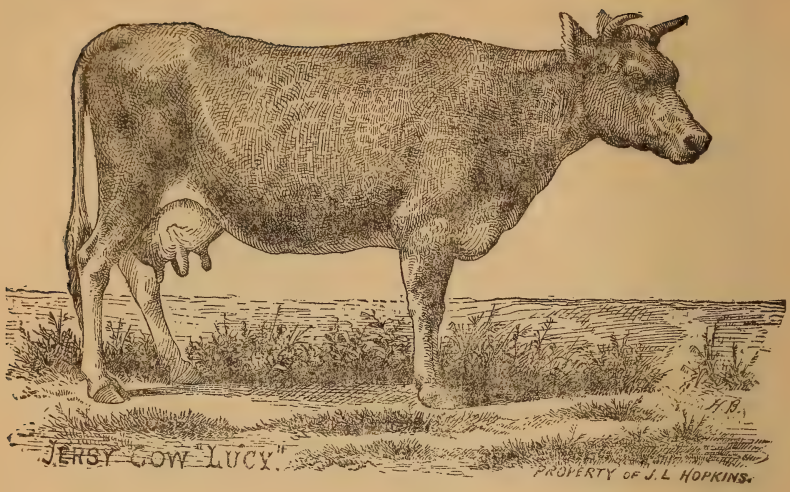
It should be remembered in reference to all the bastards that the size and form of these tufts indicate the rapidity with which the cows will decline in their yield of milk after impregnation. If they are large and pointed at the ends with coarse hair, they indicate not only that the cow will fail rapidly in milk but that the milk will be poor in quality.

The escutcheon is observable also on bulls and takes the same forms as on cows, but is of less extent. The Curveline and Limousine are most commonly met with.

Bulls for use with dairy cows should be selected with reference to their escutcheons which they transmit, probably, with more certainty, especially if thoroughbred, than do the cows.

Every farmer who cares to breed good milch cows should master this system. It is not necessary to pay much attention to the orders lower than the fourth, and hence descriptions of them have been omitted. Guenon gave eight orders.

The estimates made of the yield of the different classes and orders are based upon the supposition that the cows receive from calf-hood good attention and abundant food. If these have been neglected the actual yield will most probably fall below the estimate. As already remarked the characteristics of the different breeds of cattle must also be taken into consideration.



CHAPTER XII.

MANAGEMENT OF MILK AND BUTTER.

The first requisite, and one to which too little attention is given, is to have good, healthy cows, kindly and humanely treated. Nutritious food and pure, fresh water are absolutely necessary to the production of good milk. It is not sufficient to guard the milk while being drawn and during its subsequent management to secure purity. If the cows drink stagnant water, or that polluted by sewer drainage or other impurities, they cannot produce pure or even drinkable milk. Such water is infested with microscopic animalculæ, and the spores of fungi which, taken into the system by the cow, produce a feverish condition of the animal, and passing into the milk secretions, are drawn with the milk in which the animalculæ propagate, and the fungoid spores germinate, causing disease in those who consume the milk. Milk may be polluted also by cows breathing impure and offensive air arising from filthy stalls, or decaying animal or vegetable matter. It is not

unusual to see cows, especially in cities, leave their stalls with manure caked on their sides; such cows kept in such stalls cannot yield pure milk. Milk has been known to be tainted by cows inhaling the offensive odor of carrion exposed in their pastures. When the carrion was removed the milk, from the same cows, grazing in the same pasture, and with all other surroundings the same as before, was no longer tainted.

BAD ODORS ABSORBED BY MILK.

The room in which milk is kept should be scrupulously neat, used for nothing but milk, and thoroughly ventilated with pure air. If meats or vegetables are kept in the same room with milk it will absorb odors from them, which will affect the flavor both of the milk and of the butter made from it.

Willard, in his work on "Practical Dairy Husbandry," mentions a case which came under the observation of Mr. Lawson Tait, F. R. C. S., of Birmingham, England, in which the milk of a dairy was tainted by a peculiar smoky taste by asphalting the floor of the dairy and the surface adjacent to it. This suggested to him that it would absorb "other things which were not so innocuous," and he instituted some experiments to test its absorbing power. He says: "I at once set going a series of experiments which have led me to the belief that milk is an extremely dangerous agent for the spread of contagion. . . . By inclosing fresh milk under bell-jars with tar, turpentine, assafœtida, feces, urine, etc., I found that in most instances the milk became impregnated with the smell, and sometimes with that intensely disagreeable sensation known as the taste 'like the smell' of the substances employed. The degree to which this was acquired seemed not so much to be in proportion to the amount employed either of milk or of infectant substance, but to the amount

and quality of the cream which rose to the surface of the milk; the oleaginous molecules seeming to act as the menstruum of contagion. This is not unlikely, when we remember that the best solvent for nearly all odoriferous principles is oil. . . . If we bethink ourselves of any instances of diseases which might in certain instances be communicated by milk, typhoid fever stands out with fearful probability."

The necessity, therefore, of pure water, clean stalls and wholesome food for dairy cows, as well as the importance of setting the milk in a pure atmosphere, free from the presence of any matter from which it could absorb offensive taints, will be appreciated.

Those having the care of milk cannot be too scrupulous as to cleanliness, not only in the apartment in which it is kept, but in the vessels used to contain it, and the water employed in cleansing them.

There are two principal systems now in use where much attention is given to dairy husbandry, viz: the Cooly and kindred systems in which the milk is set in deep pans, immersed in cool water, and the Furguson plan, in which a cool current of air instead of water is used. Neither is practicable in the South, under ordinary circumstances, since ice is required in each system.

Those who have cool springs conveniently located can use the Cooly system. There has, of late years, been much discussion in the Agricultural press upon the merits of these systems, and the appliances used in each have received from year to year such improvements as the experience of practical dairymen have suggested, until now they seem to have almost reached perfection.

The relative merits of deep or shallow pans for raising the cream have also been freely ventilated through the agricultural press, but the advocates of the different plans have viewed the matter from such widely different standpoints that often both have been right when their sur-

roundings have been ascertained, while both were wrong in endeavoring to insist upon the universal adoption of either system regardless of surrounding circumstances. In this, as in every other department of husbandry, one must be controlled, to a large extent, by the surrounding circumstances. In the South the deep pans may be adopted to advantage by those who have spring-houses, or who have their dairies adjacent to wells of cool water, with appliances for running the water around the milk at short intervals of time. In the absence of these conveniences, a cool basement-room on the north side of the house into which the cool morning-air is admitted and from which the heated noon-air is excluded, but with ample ventilation from above, will probably give most satisfactory results.

The sub-earth ducts by which a cool current of air is conducted for some distance under the earth into the dairy and the warm air conducted out through the top, the current being induced by a heated flew, or large lamps at the top of the dairy, if on a small scale, have been successfully adopted in some localities. The air is cooled and purified by its passage through the sub-earth ducts, and enters the dairy cool and fresh, and is constantly renewed by the removal of the warm air from above.

On ordinary farms in the South, so little preparation is made for the care of milk that it cannot be said that any system prevails, either as to arrangement of dairies or as to the manner of setting the milk.

If the surroundings are such that the milk is necessarily exposed to a high temperature, and consequently sours in a short time, shallow pans are best, since they admit of a more prompt rising of the cream. If a low temperature can be maintained, the deep pans are more convenient. Milk should be set as promptly as possible after it is drawn, since if the cream has begun to rise before straining, it is re-mingled with the milk, and will not so readily separate itself again.

WHAT IS CREAM, AND WHY DOES IT RISE TO THE SURFACE?

Cream is an aggregation of globules of oily matter, varying in size in the milk of different breeds of cattle, as well as in the milk of the same cow. These globules contain the butter inclosed in sacs. They, having less specific gravity than the watery parts of the milk, rise to the surface, the larger ones first, and the balance in the order of their size, the smaller rising last. In the milk of Jersey cows the globules are larger than in that of those of other breeds, and hence the cream rises more promptly in the former than in the latter. In the milk of the same cow, however, the globules differ in size. The larger ones having a greater quantity of the oily matter in a body are lighter, and hence rise first. In deep pans this arrangement of the globules in the cream in the order of their size is more complete than in shallow pans.

CHURNING

Is simply such an agitation of the cream separately, or of the cream mingled with the entire milk, as will rupture the enveloping cases of these globules, liberating the oily particles, which, cohering to each other, "collect" and form butter. The globules in Jersey milk, being larger than those in other milk, and the encasing sacs more tender, it requires less agitation and a shorter time to get the butter from it. The globules also being more uniform in size, the butter "comes" more nearly all at once, and hence there is less risk of over-churning, and the grain is better preserved.

In milk in which there is greater difference in the size of the globules, the larger ones are ruptured some time before the smaller ones, and hence the grain of the first that "comes" is destroyed by over-churning before the oily matter is liberated from the smaller globules.

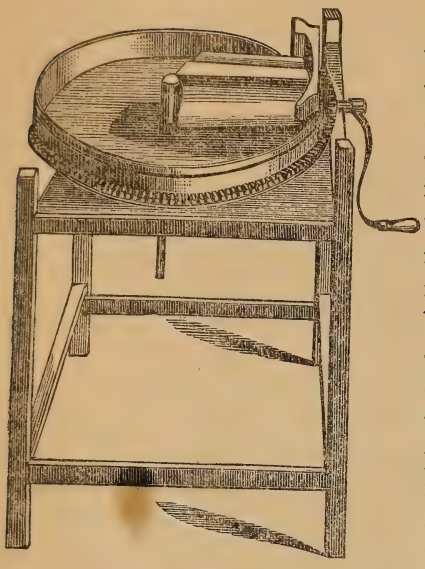
The same effect is produced by churning old cream with new. The sacs of the older cream are more tender, and are ruptured more easily than those of the new, and, as before, over-churning occurs.

The same effect is produced by too rapid churning, or by the use of dashes with cutting edges, such as the turbine wheel dash, perforated tin funnels, etc.

Avoid all dashes and churns which claim to get butter from new milk in five minutes. While this is possible, the texture and consequently the quality of the butter is injured.

To secure good results in butter, milk should be kept at as nearly a uniform temperature as possible, and should be neither too warm nor too cold when churned. If too cold, it will foam, and require long churning to get the butter; if too warm, the butter, when it "comes," will be too soft to gather and of poor quality, both as to color and texture. From 65° to 70° F. is the best temperature that can be attained in this climate, under ordinary circumstances, and one at which churning is easily done.

Butter is often injured by over-working after it is taken from the churn. When this is the case, it has the same clammy and tallowy texture that results from over-churning. The grain is destroyed by heating or excessive working, especially when it is warm during the operation. The only object in working butter at all is to free it from the milk that becomes entangled in it during the processes of churning and collecting it. There are various mechanical appliances in use for removing the milk from butter, some of which are highly recommended by practical dairymen.



That represented by the accompanying illustration is in use in some of the largest Jersey dairies in this State, and is perhaps the best in use. It effectually removes the milk without injuring the grain of the butter. There is no excuse for the production of white or inferior butter in Georgia, if the proper food is provided for the cows, and milk and butter are correctly managed; yet "country butter" in our cities is almost synonymous with poor butter, especially during the winter. With our facilities for providing green food for cows during winter, our best butter should be made then, and is in some dairies, which are carefully and judiciously managed.

So rich and yellow was the butter from the dairy of Mr. J. B. Wade, of DeKalb county, last winter, that purchasers objected to it on account of the color, suspecting the use of artificial coloring matter.

The use of annotto for coloring butter is quite common in Northern dairies during winter when green food cannot be had for the cows. This is a red coloring matter obtained in South America and the West Indies from the pulp surrounding the seeds of the annotto tree (*Bixa orellana.*) It is considered perfectly innoxious, but since it adds nothing to the flavor of the butter, and is used to impart the appearance of first-class butter to what is in reality an inferior article, it is a species of deception which, to say the least of it, is not commendable.

OLEOMARGARINE

Is an imitation of butter which so nearly resembles it in appearance as to deceive the unsuspicious. Large quantities of it are sold as butter without detection, even by the consumer. It retains its consistency under a warm temperature better than butter, and hence bears shipment better and keeps longer. Analysis shows it to contain substantially the same ingredients as pure butter and to possess no properties deleterious to health. Recent experiments with this compound, however, show that it forms an emulsion less readily than pure butter, and hence is supposed to be less readily absorbed by the system.

If sold as oleomargarine, there seems to be no reasonable objection to its sale; but if sold as pure butter, as is generally the case, a fraud is perpetrated upon the purchaser and consumer which should be punishable under the law.

It can be detected very readily by the peculiar odor derived from the oil of tallow used in its manufacture.

The fat of beeves is ground or finely cut by machinery made for the purpose, and then subjected, in steam-heated vats, to a temperature of 150° F., causing the greater part of the fat to separate from the fibre and rise to the surface. This is drawn off with a syphon into a water-bath, and salt added to hasten clarification. It is then drawn off, and allowed to solidify somewhat. It is then pressed, the part remaining, being principally stearine, is rejected; the part which flows off is churned with milk to impart somewhat of the flavor of butter to it, and then seasoned with salt and colored with annotto. The whole process of manufacture is cleanly and the product an excellent imitation of butter, and if fresh, healthy fat is used for its manufacture, it contains nothing injurious to health. Vegetable oil, such as pea-nut oil, is sometimes used in its manufacture, when much stearine is retained, for the

purpose of reducing its melting point more nearly to that of pure butter.

KEEPING BUTTER.

A cheap and effectual method of keeping butter through the winter is as follows: Work the milk from the butter as thoroughly as possible, pack firmly in stone jars, cover with an inch of fine salt even with the top of the jars, tie a cloth tightly over them, and invert in a cool, dry room. The butter thus packed in September will be perfectly fresh and sweet when opened in spring. Another plan practiced by some is to wrap pound packages in cloth and immerse in sweet brine made of strong salt.

A Virginia lady writes: "I have tried two methods of keeping butter successfully from September to the following May or June; one by packing in stone jars, covering an inch deep in salt, binding a cloth tightly over it, and turning it upside down. The other is to tie each churning in a clean cloth and drop it into brine, keeping it well pressed under. This brine must be as strong as it can be made—boiled, skimmed and strained. In either of these methods the butter must be pure to keep well. It is such an absorbent, it is all important to keep it free from all odors, and to have all vessels in which the milk is kept or in which butter is packed kept exclusively for that purpose. Butter must of course be well worked, taking care not to break the grain. If the grain is broken it will not keep at all. The brine effectually excludes the air and keeps the butter in exactly the same condition in which it was put away. If some rolls have less salt than others, they will not be altered by the brine, as one would suppose. I prefer this method to packing in stone jars—it is more reliable and far less trouble. If wooden vessels are used, they should be of oak."

If, however, dairy farms are properly managed in Georgia, there will be no necessity for packing butter for

winter use. Winter dairying, with our facilities for producing green food during the entire year, should be made a specialty, and "gilt-edge" butter sent from Georgia to the Northern markets.

This will be further discussed in the chapter on "Grasses and Other Forage Crops."

CHAPTER XIII.

HOW TO JUDGE A BEEF—BUTCHERING, AND HOW IT SHOULD BE DONE. CORNED BEEF—COOKING BEEF, ETC.

It is important that those who sell as well as those who buy should be able to judge of a beef on the hoof. There are certain points which indicate the degree of fatness and the quality of the meat, a few of which will be noticed. As remarked in the chapter on the different breeds of cattle, beef-producing qualities vary with the breed. Like capacity for milk-production, that of beef-production has been developed by careful selection and breeding. The Texas steer or one reared on "the range" in Georgia, contrasted with an improved Short Horn or Hereford ox both as to size, form and quality of the meat, illustrates better than any description can, the wonderful improvement wrought by skillful selection, breeding and feeding. In the former the flesh and fat are taken on irregularly, and often as otherwise in the less desirable parts of the carcass, while in the latter they are more uniformly distributed and placed principally on the most desirable parts. It is economy, therefore, if beef is the object of the breeder, to select one of the early maturing easy fattening, beef-producing breeds, since they give more and better beef for a given quantity of food than the slow-growing, less compact kinds. For beef animals in

Georgia a cross of a Short Horn or Hereford bull on the common cow will give fine results. Many who will read this are familiar with the influence of such a cross on the native cows of a neighborhood in the improvement in the size and appearance of the cattle. The effects of such a cross made in Hancock county in 1861–'62 and '63 are still visible.

The ratio of flesh to "offal" determines the true value of an animal for beef purposes.

The body of a properly formed beef animal, when thoroughly fatted, should, to use Allen's expression, "be nearly an oblong square." In such an animal there is very little "offal" compared with the valuable parts. Such form implies well-arched ribs, giving ample chest capacity for the accommodation of full lungs and sound digestive organs, broad hips, a well filled twist, a heavy brisket and full flank.

The hind quarters furnish the most valuable part of the beef—such form implies full development of these parts with small bone, well-rounded hams, marbled flesh, and a uniform distribution of fat over the entire carcass.

An animal with a narrow, flat chest, long legs, small hips, heavy head, large bone and flat hams will prove profitable, neither to the breeder, grazier, the butcher nor the consumer. Few animals with large head and large bone and flat hams will prove profitable feeders or good beef, while one with small head, fine bone and a flexible skin will generally fatten well and yield tender, fine-grained, juicy beef. Experienced judges of cattle rely much upon what is technically called the "handling" which has reference to the "feel" of the skin and the flesh immediately under it. A "hard handler," says Allen, "is one with a tight, close skin, with little or no yielding of the flesh beneath; a "soft" or "good handler" denotes an elastic or springy touch, both skin and flesh yielding, like a small, hollow India-rubber ball, to the pressure of the

fingers, and the skin easy of movement over the flesh—not *flabby*, as is sometimes the case with a very thin-skinned and sleazily made-up animal. A 'hard handler,' denotes a bad and slow feeder, and tough meat. A "soft" or "good handler" denotes tender, juicy meat,and a quick, profitable feeder.

To the eye there are also certain points which reliably indicate the degree of fatness and the quality of the meat. Besides the size and fineness of the head and bone, the following points should be carefully noticed as indicating a high degree of fatness, and being well developed only on well fatted cattle. These are the roll back of the shoulder, shown as the animal walks, a plump and "well let down" flank, full twist or "breeching," as sometimes called, and, if a bullock, a full, round cod. Rolls of fat on each side of the root of the tail also indicate an advanced stage of fatness. The ribs of a very poor ox show prominently, those of a moderately fat one show but little, while those of a very fat animal appear prominent on account of the accumulation of fat on the outside. A careful observation of these points, together with the 'handling" and general square, plump form of the animal will rarely deceive one in judging a fat beef.

BUTCHERING

Should be understood by every farmer, whether he expects to perform the operation himself or not, since under our system of labor, with the frequent changes occurring in the labor employed on the farm, the farmer can have no assurance that he will have in his employ a man who knows how to butcher a beef.

It is not proposed to give detailed directions for butchering but simply to make a few suggestions which may be of service to the inexperienced. The best way to learn how to butcher is to assist an experienced butcher in the performance of the operation, observing closely every part of the process.

The animal to be slaughtered should be prepared for it by a fast of twelve or eighteen hours in order to relieve somewhat the distention of the intestines, and thus facilitate their manipulation.

It matters not whether the axe or the rifle be used for killing, provided it be so executed as not to injure the flesh of the beast, and provided the knife is promptly used on the neck veins to insure thorough bleeding, and the animal be placed in a position favorable to the effusion of the blood. As early as possible after the bleeding the hide should be stripped from the hind legs, a gambrel inserted and the animal hung up. The practice of skinning on the ground is a slovenly one and seriously injures the appearance and quality of the meat so slaughtered. If one has not a scaffold with rope and windlass, a stout pole, with one end resting on the ground and the other in the fork of a tree, on a side hill, will answer very well. Have the beef to drop with head down hill at the end of the pole, and as soon as ready slip the gambrel up the pole until the animal swings. If no suitable tree stands on a side hill at a convenient distance from the farm-house, a fork or post may be substituted. The utmost neatness should be observed in the preparation of the meat, which should not be cut until cold and firm.

When beef is butchered in cool weather, say in December, so much of it as is intended for steak may be hung in a cool place without salt, and steak cut from it as needed, rubbing a little dry meal over the freshly cut part to prevent drying and crusting. The longer the meat hangs without salt the more tender the steak will be. Salt hardens and toughens meat, and should be used on beef only when necessary for its preservation. No matter how well fatted beef may be,or how carefully and neatly butchered, steak must be cooked well to be eatable. A poor steak well cooked is better than a choice one poorly prepared. *Broiling steak* is a very simple process and yet we

rarely find a properly broiled steak on either public or private tables.

The too common practice of pounding or chopping steak for the purpose of making it tender has the effect of depriving it of its juices, its very essence, leaving only the fiber of the cellular structure. The prime object in broiling a steak should be to preserve the juices in the steak itself, and not in the gravy. Pounding steak before cooking, and then extracting its juices into the gravy, to be used with it, reminds one of grinding apples, pressing out the juice and then pouring the cider over the pulp to season it to make it palatable. The gridiron was formerly used exclusively for broiling steak, but this is by no means necessary. An ordinary pan will answer quite as well. Place the pan on the stove until quite hot. Cut the steak of uniform thickness—from half to three-fourths inch—lay it in the pan, using care to have every point of it come in contact with the hot pan, and turn rapidly to avoid burning. Have butter, pepper and salt in a hot dish at hand—with a little of this baste the steak when nearly done to increase the flavor if desired, or simply lay the steak in the dish and with a spoon pour some of the butter over it. The object in having the pan hot when commencing to broil the steak is to sear the outer surface to coagulate the albumen, and thus prevent the escape of the juices. Rapid turning is necessary to prevent over-cooking the outside before the interior is sufficiently done. When "rare done" the inside of the steak will be red, but when cut no blood will escape. At this stage it is more tender, better flavored and more digestible than when cooked more. The best steak will be tough if cooked slowly. The ordinary method of frying beaten steak with lard destroys the flavor of the steak, and renders it less digestible than when properly broiled.

In baking or roasting beef, it should be subjected at first to a high degree of heat, as in broiling steak, to coagulate

the albumen of the surface to prevent the escape of its nutritious fluids; this done, it should be subjected to a slow heat until the interior is cooked to redness, but so that the juices which escape when cut will not be tinged with blood. A little water should be put into the pan in the commencement of the operation, and the surface of the meat basted repeatedly during the progress of the cooking, with the gravy from the pan or oven. When the slow heat is applied "dredge" the meat with flour to serve the double purpose of closing the pores of the surface and of imparting a pleasant brownness to the meat when cooked. Roasting and baking are used to indicate the same process, the only difference being the exclusion of air in the latter and its admission in the former process.

If fresh meats are to be boiled they should first be immersed in boiling water for a few minutes, and then cold water added to reduce the temperature to a mere simmering, which should be continued until the meat is done. The usual rule as to time is twenty minutes to the pound of meat. The scum that rises to the top while boiling should be removed. In boiling meat to be eaten as such, we desire to retain the juices as much as possible in the meat, and hence it is first immersed in boiling water to coagulate the albumen of the surface. In boiling for soup we desire to extract the nutritious juices *from* the meat, and hence it is put into cold water over a slow fire, and gradually brought to the boiling point. If vegetables are used in the soup, they should be boiled separately and added to the soup before it is done. If put fresh into the boiling soup they will be toughened and will not boil to pieces. The head and hoof of beeves are thrown away by some, while by others they are highly esteemed. Several choice dishes may be made from the beef's head. If boiled thoroughly and cut fine, it may be made into pies or stews, or placed in a dish with bread crumbs on top and thoroughly browned. These dishes are seasoned

with pepper, salt and perhaps a little onion to suit the taste, and are both good and economical. Another dish is made from it by chopping it fine, and mixing it with some cold ham—fat and lean—bread crumbs and an egg or two. Knead them well together, form into round or oval balls, roll in a little flour and fry a light brown. The head of a large beef will not cost, at most, more than twenty-five cents, and will supply an ordinary family for several days with choice dishes.

The feet nicely dressed and thoroughly boiled (besides making nice neats-foot oil) if cut up fine, rolled in flour and egg and fried, make a choice dish. For making soup, no part of the beef is equal to the tail.

CORNED BEEF

Should be in the store-room of every farmer's wife during winter and spring. An experienced housekeeper of Virginia sends the following recipe for preparing it: "Salt the beef as usual, adding a "pinch" of saltpetre to each piece. Let it remain in salt three days, drain off the bloody brine formed by the salt, and wipe each piece with a clean towel and re-pack in the tub—a syrup or molasses cask will answer. For the brine, take as much water as will cover the beef and add salt until it will no longer dissolve it, a tea-cup of ground saltpetre and a quart of molasses, or its equivalent of brown sugar. Boil this and skim well. When entirely cold, pour over the beef and keep it well pressed under the brine. These proportions will answer for 200 pounds of beef. Should the brine mould in warm weather, re-boil and skim, adding half pound of bi-carbonate of soda, and when cold return to the beef. Corned beef should be boiled until the bones can be taken out and allowed to cool in the liquor in which it was boiled. It should not be cut while warm." Pieces of the beef which would be inferior if cooked while fresh make delicious meat when corned by this recipe.

The "round of beef," or a piece cut from the thigh where the best round steak is taken, cutting entirely through with a thickness of six or eight inches, makes when corned by the above recipe a delicious dish either boiled and eaten cold or broiled with butter and pepper.

CHAPTER V.

SOME DISEASES TO WHICH CATTLE ARE SUBJECT IN THE SOUTH.

There is probably no country in the world in which cattle are more exempt from disease, or in which they are subject to so few diseases, as in the South. In colder climates where it is necessary to protect cattle in warm houses during winter, they are liable to many serious complaints almost unknown in Southern herds, such as consumption, pneumonia, and other diseases resulting from climatic influences, and defective ventilation in the barns in which they are kept in winter.

A full discussion of the diseases of cattle cannot be had in a single chapter of a work limited in scope as is this by the small fund which can be devoted to printing, nor is such full discussion necessary in a work prepared especially for Georgia farmers, who will be better served by confining the discussion to diseases which are likely to occur in their herds.

RED-WATER

is the only disease which is at all fatal to cattle in Georgia, and hence the larger part of this chapter will be devoted to its discussion. Fortunately for the objects in view, this disease has recently prevailed in some of the finest Jersey herds in the State, and has received at the hands of the Jersey breeders the most careful attention.

Advantage is therefore taken of their so recent experience and observation, the results of which are given for the guidance of others whose herds may in the future suffer from the attacks of this our most fatal cattle disease.

At the request of the Commissioner of Agriculture, several gentlemen who have had practical experience with this disease have given the results of their experience and observation for the benefit of the farmers of the State.

In July last this disease broke out in the choice herd of Jerseys, of Maj. W. B. Cox, of Atlanta, on his farm in De Kalb county. Under date of Sep. 1st, 1880, Dr. H. L. Wilson, who attended Maj. Cox's cattle, writes:

"At the request of Maj. W. B. Cox, I give you some facts relative to the recent sickness in his herd of Jersey cattle. Immediately succeeding the heated term in July, his cattle that were then at the pail, began first to decline in milk and in from twelve to twenty-four hours refused to take food. With drooping heads they stood in a drawn position evidently in pain. The urine was quite red at first, hence the common name of the disease, "Red-Water" —and continued to deepen in color until it was like port wine, just before death.

"After he had lost one or two, I went out to his farm to endeavor to assist him, if possible, in saving the balance from death. I had a post-mortem examination and found the last stomach in a high state of inflammation, extending through the duodenum, or first intestine. The gall-bladder was distended until it was as big as a large cocoanut, the bladder almost ready to burst from distention with bloody urine.

"The kidney, and in some instances, in subsequent post-mortems, the liver, was congested.

"His herd had been grazing on a very rich bottom, covered with clover and grass. My opinion was that the succulent feed that was in a high state of development, and the excessive heat were the causes of the trouble. I

therefore advised active purgation; but all attempts at thorough purging failed, save in one animal. I gave salts and lard freely, but with no good results. One cow, Optima, the queen of his herd, was powerfully purged, and directly afterwards I ordered fluid extract of ergot, one ounce, and spirits of turpentine, two teaspoonfulls, given with drench of flax-seed tea and lime-water. She continued to improve and is now well, but *seven others died.* Now, remember that all of those that died failed to purge, and died in from twelve to thirty-six hours after failing to give milk or to eat. Immediately after this sickness, Maj. Cox removed all of his stock to a highland pasture, in which there is plenty of shade and a spring branch. Here they did well until the last week in August when seven more were attacked in the same way, two of which died, making his loss within a few weeks amount to nine in number. Now, is it epidemic, or heat, or excessive feed in damp low-grounds, or what is the cause? I am informed that quite a number of cattle have been similarly attacked and have recovered, but I do not believe that they could have been so malignantly sick as those I saw. I am satisfied that unless actively and promptly purged they invariably die."

Mr. J. B. Wade, under date of Atlanta, Aug. 26th, 1880, writes:

"During last year and the year before, nearly all of my Jerseys at 'Oak Shade Farm,' in DeKalb county, were sick. As all of them were brought from the North, I think the sickness was caused by a change of climate. None have, as yet, had a second attack. The first case occurred in July, the last on the 29th of October. The symptoms among those of mine that were attacked, were all similar in their characteristics, and were so marked that the most inexperienced person would not fail to detect the sick animal. In the case of milch cows, the first symptom noticed was a total cessation of milk secretion. In

every case the animal would lie down with its neck stretched forward, under jaw resting on the ground, ears drooped, eyes half closed and running water, a clear, ropy discharge from the nostrils, no 'sweat' on the end of the nose, which an animal in good health always has, a constant gritting of the teeth. The worst cases would utter a low, plaintive moan and seem to be in much pain, and would offer no resistance when drenched or injected. If standing, the back would be drawn up and the head drooped. A rapid emaciation begins with the commencement of the disease. With the exception of one or two cases out of probably twenty, obstinate constipation was a symptom. Two cases began with bloody urine, but with all the others this was an after symptom. In every case there was high fever, quick pulse and hot, dry skin.

"To move the bowels as quickly as possible was my aim. To effect this I gave a cow a quart of lard, warmed sufficiently to liquify it, and immediately followed it with a quart of flax-seed tea. If there is no action from the bowels in two hours, repeat the dose in smaller quantity, say one pint—if still no effect from the lard, in four hours more give another pint. I gave a quart of flax-seed tea every two hours until four or five doses were taken, I injected the first cases I had with soap-suds, but do not think this did any good.

"In cases of constipation, the first operations will be very compacted, hard, dry and black, and in small quantity. For this I did not stop giving the lard, but continued it in pint doses 'till the feces became softer, of lighter color and more copious. Then another trouble began. When the lard did take effect it would produce a violent case of the scours, and if the cow was with calf this would produce abortion. Several persons told me that Epsom salts should have been substituted for the lard, and I tried it in a few cases but found it was slower in its effects, and so went back to the lard, thinking it better to lose the calf than to let both die.

"The object of the flax-seed tea was to operate on the kidneys, and in every case, at the beginning, this was given whether they had bloody urine or not, and when they did have it, I continued to drench with the flax-seed tea till the urine changed from the bloody color. When the attack was broken and they began to convalesce, the first food they were given was two or three pieces of dried beef, the size and length of the little finger. The first piece would have to be forced into the mouth and held there till they chewed and swallowed it. After that they would follow around for more. They were given a few pieces of the beef several times a day for two or three days, or until they had an appetite for bran and hay. The beef is an appetizing and nutritious diet. Every case I had recovered and in two or three weeks, they were as fat as ever and livelier than they were before they were sick. I should have mentioned that I gave them shorts or bran with a very little ground flax-seed as soon as they would eat. If much flax seed is put in the bran they will not eat it. I have had only one case of an animal being sick that was to the 'manor born,' and that was a calf three months old. He had no 'Red-water' symptoms, but in all other respects was sick just as the others were."

Judge John L. Hopkins, whose stock farm is near Atlanta, in Fulton County, under date of September 2, writes:

"Immediately after Major Cox's losses from the disease called 'Red-water' I reported the cases to the *National Live Stock Journal* and also to the *Country Gentleman*. The matter was referred by the *Journal* to Dr. Paaran and by the *Country Gentleman* to Dr. Moore, both of whom are educated, competent veterinary surgeons. I enclose their replies. Dr. Paaran's prescription was received first, and I used it mainly, but Dr. Moore's was used also, both with satisfactory results. I had in my herd five severe cases, four of them my very choicest animals. They were

all saved, and undoubtedly it was accomplished by this treatment. It should be understood that death cannot be averted unless the disease is promptly and courageously met at the start. A few hours' delay and death is almost certain. I inspect every animal on my place twice a day, and all during the day they are under the eye of Mr. Martin, the herdsman. The very moment that a change occurs it may be observed. The practical, observant man, who is familiar with his cow, can tell in an instant whether there is anything wrong with her just as certainly as he can say whether it is joy or sorrow that is depicted in the countenance of a familiar friend. When that change comes it must be met then and there, as it will be too late. Should the flow of milk fall off suddenly, without a known cause, such as fright, excitement, etc., or should the appetite fail, do not wait for more, it is safe to resort to the remedies at once. The linseed tea should be made from the seed unground, to be sure that it is pure, and the tea should be as strong as it can be made. Let the portion be over rather than under a quart, and let the medicine be administered by the watch. A negligent or unfaithful attendant will be of no service. With the first discharge of red water the animal appears to almost let go of life, and then, after the bowels are moved, the hope lies in linseed, the gentian and iron. Drs. Paaran and Moore unite with others in attributing the disease generally to low land or inferior pasturage, and that may throw some off their guard. Helga—one of my cows, and the very queen of Jerseys—had the disease, and hers was one of the most stubborn cases. About three weeks before she took sick she slipped a horn. She was tethered in a lucerne field, within reach of the shade of some apple trees. The tether was moved from day to day, and she was kept on that purest and best of pastures, lucerne and crab-grass. She was given bran, and had oil-cake also. The other cattle were fed freely on green corn, bran, oil-cake and cotton

seed meal, and ran on young orchard-grass pasture. I am satisfied that Helga was gorged with her green food and the others with the green corn. I at once purged every animal on the place, and let them down for a few days from the high feeding, and then gradually and cautiously returned to a proper diet. The disease has not re-appeared."

Dr. Paaran's reply to Judge Hopkins' inquiry, taken from the *National Live Stock Journal* of August, 1880:

"According to the description, the disease from which the cows died was no doubt the so-called Red-water. It is stated that the cows were kept in a low meadow, with high and rank grasses. Such land, besides containing coarse and innutritious grasses, very frequently contains also plants or shrubs possessing acrid, bitter or astringent principles. The consumption of such herbage in unlimited quantities is often productive of serious disorders, and especially of irritative fever and inflammation of the urinary organs. We are requested to suggest preventive and corrective measures. Prevention consists in discontinuing the use of such grounds for pasturage and removing the animals to grounds, preferably higher ones, and which contain no deleterious herbage. In the beginning of the disease a purgative dose should be given, consisting, according to the age of the animal, of from one pound to a pound and a half of Epsom salts dissolved in a pint of hot water, to which has been added a pint of treacle (molasses). Also give, every hour, a quart of linseed tea, besides injection, per rectum, of linseed tea. When the bowels have been attended to, stimulants and tonics should be administered, to counteract the prevailing great lassitude and weakness, such as an ounce each of aromatic spirits of ammonia and compound tincture of gentian, or an ounce each of compound tincture of gentian and tincture of per-chloride of iron, either of which should be given in a pint of cold gruel or linseed tea, and repeated

every two or three hours. Give all the linseed tea the animal will drink, and feed on gruel or steamed or boiled food."

The following inquiry by Judge Hopkins and reply by Dr. Moore are taken from the *Country Gentleman* of August 12, 1880:

RED-WATER IN CATTLE.

"A terrible cattle disease has recently been prevailing here. Its first symptom is the passage of red urine and the discharge of matter from the nose that scalds the skin of the nostril. As the disease progresses the urine turns darker, and when, finally, it gets dead black, there is no escape from death. The cows were sick two or three days. They had every possible attention, and every known remedy was applied, but to no purpose. One of the cows was cut open after death, and it was found that her bladder contained over a gallon of perfectly black water. The poor things appeared to suffer terribly, but could not be roused from a dull sort of stupor that seized them after the disease had fairly taken hold. The disease is not contagious or infectious, nor is it confined to Jersey cattle or to any sort of fine cattle. There are many common cows that have died of the same trouble. What is it, how should it be treated and how may it be prevented? We greatly need a competent veterinary surgeon—an educated, experienced, skilful man. Such a person would do well here. A large amount of money has been invested in Jerseys in this county, and we are full of anxiety. The herds have all been doing well. J. L. H.,
Atlanta, Ga."

ANSWER BY DR. EDWARD MOORE.

"Hæmo-albuminuria, black water, bloody urine, red-water, etc., are among the titles given to a disease of cattle, characterized by the color of the urine, which, accord

ing to the stage of the disease, is red, coffee-colored or black. It is loaded with albumen, and contains considerable coloring matter from the blood. It is non-contagious, but, owing to the fact that its immediate cause is to be found in the nature of the food which the animals receive, and inasmuch as oftentimes a large number are fed alike, consequently the majority are stricken down with this terrible disease. Those who do not understand it are apt to look upon it as contagious. Food containing flesh and fat-forming matters in small proportions, with excess of water, is the great factor in the commoner form of this disease, and unquestionably the case in the instance before us. It is a much rarer disease in this country than on the Continent or in Great Britain. It follows bad weather, and results from inferior pasturage—inferior both as to quantity and quality. The same may be said of roots; that is, those poor in quality are known to be productive of this disease. The blood is thus robbed of its richness and purity, and in consequence some of its components, which are unfitted for the performance of their natural functions, are excreted in large quantities by the kidneys and with the urine gain exit from the body. The vital fluid (the blood) thus impoverished is not capable longer of keeping up the tone of the system, and various organs give way to disease; and, depending upon the particular ones which sympathize, we notice peculiar symptoms. The liver, intestinal canal and kidneys are usually affected largely, often followed by brain sympathy. The heart is also very abnormal in action, owing to the changed condition of the blood. There is another form of this disease, which sets in about a week or two after parturition, but it is not necessary to speak of that now. In the treatment we find that a knowledge of the cause is necessary in order to render either prevention or treatment rational. To prevent it should be the first aim, and this indicates a study of the condition of pastures, seasons and weather;

land undrained, low and wet, rank, innutritious food and roots grown on rich, moist lands should be avoided, and the disease will disappear. Remedial measures for those affected are often unsatisfactory, for the reason that animals become so anæmic and prostrated before they receive any treatment that it is of no avail. Give them, in preference to quack nostrums and drugs, large quantities of blood or albumen in the shape of eggs beaten up with milk, giving also something to strengthen the system weakened by the causes enumerated. We can now suggest, with a hope of success, a line of treatment simple and complete: Give daily for several days from a pint to a quart of raw linseed oil, even if diarrhœa is present; chlorate of potash, 3 dr., in water thrice daily; chloride of sodium, 6 oz.; powdered capsicum, 1 dr.; powdered gentian, 1 oz.; and sulphate of quinia, 30 gr., twice daily. Without skilled treatment the fatality is very great."

Col. Richard Peters, says:

"My first experience with Red-water was in 1856 and 1857. I had collected from all parts of the United States and from England a herd of 100 head of thoroughbred North Devon cattle, with a few of the Durham and Ayrshire. My improved Devons from England cost nearly $500.00 per head. I had sent three of them to my farm in Gordon county, and retained three of them in Atlanta, keeping them stalled, or in the shade. They reached America in February or March.

Those at the farm ran in the fields with the other cattle. Early the following August the Devon bull was attacked with Red-water. He was drenched with 1½ lbs. of Glauber salts and some spirits of turpentine. In about three days he died—not then knowing he had the Red-water. About the last of August other cases appeared and at the same time my English cattle at Atlanta were taken. I used freely salts and spirits of turpentine on the entire herd, both at the farm and in Atlanta, giving a dose twice

a week. I sent to the farm an Irish cow-doctor, who had some reputation in Atlanta, with a collection of medicines which he said were used in the "ould" country, promising him $10.00 a head for every cow he saved. He used drenches and injections extensively, but all the cows under his treatment died. On his return I asked him why he was unable to save them. He replied, "They are different from the cows of the 'ould' country, they died too 'quack' for me;" meaning that the disease was more virulent than he had seen it in Ireland—the animals dying generally in from twenty-four to forty-eight hours after they were taken. I lost all of my Durhams, part of my Ayrshires and about twenty-five head of Devons, including the six imported from England. Three of the latter died in Atlanta and three at the farm, five within the same week, though separated from each other at a distance of eighty miles, north and south—those in Atlanta in the shade on dry food, and those at the farm on pasture.

The disease re-appeared at the farm the next season, but in a milder form. On its re-appearance the entire herd were drenched twice a week with salts and spirits of turpentine. I lost but few cases the second year, and from that date to the present time the disease has not been on the farm as an epidemic.

During the years 1876 and 1877 I was engaged in large shipments of beef cattle to Edisto Island near Charleston, S. C. Without exception, all the cattle purchased during the summer from the mountains of Georgia became more or less affected with Red-water within ten or fifteen days after their arrival at the Island. About half of them died and the others required six or eight months to recuperate and get fat enough for market.

The Durhams purchased in Middle Tennessee died of Red-water even more rapidly than the Georgia mountain cattle, while those purchased in Middle Georgia were sel-

dom affected, and those from Florida appeared to be ex empt from the disease.

During the war, at the time of the invasion of Kentucky by the Confederate forces, a large number of Durham cattle were purchased and sent South for the use of the army. Several herds were pastured on my farm during July and August. I noticed one herd of over 200 head in charge of a herdsman with whom I was acquainted. The cattle were all driven to the banks of the Etowah river, where they remained until after the battle of Chickamauga. On my visit to the battle-field I saw the remnant of the herd of 200 head referred to. It consisted of a small Georgia bull yearling and one Durham heifer. The man in charge told me they had all died of "murrain" between the Etowah river and Ringgold. I saw in a lot in which the drove had remained two or three days ten or fifteen of the dead cattle.

"Cattle should not be moved in the cotton States between the months of March and October, unless they are under six or eight months of age.

"In July of this year (1880) a gentleman from Tampa, Fla., visited Kentucky and purchased a lot of very handsome Durhams, old and young, together with some very fine Cotswold sheep. I cautioned him as he passed through Atlanta to keep them out of the sun. I heard from him a few days since (September 3rd) and he had lost all of his Durhams except the calves, and the Cotswold sheep were doing badly and would, he thought, die before winter. The lot must have cost him not less than $1,500.00.

"My experience has taught me that the Durhams are more liable to this disease than any other breed, probably on account of their size and plethoric habits, the Devons next, then the Ayrshires. The Channel Island cattle seem to be about equally with the natives subject to Redwater.

The great secret in doctoring cattle affected by Red-water is in taking the disease in its incipiency. A herd of improved cattle should be closely watched when there is danger of the disease in the neighborhood, or where any have been recently brought from abroad. It occurs generally between the middle of June and the last of September. The first symptoms in milch cows is immediate cessation of milk secretion. In twelve hours the cows will be entirely dry. With others than cows in milk, the first symptoms are refusal to eat, standing apart from the rest of the herd, and, when driven, lagging behind. If offered fresh water they will usually urinate and then the color of the water can be observed. Every animal attacked should be immediately drenched to bring about an action of the bowels, using 1½ lbs. of Epsom salts for a grown animal and a pint of castor oil in extreme cases, adding two or three drops of croton oil. The doses should be repeated every six hours until the object is accomplished. Drenches of flax-seed tea should also be given in quart doses. Mr. J. B. Wade, of DeKalb county has been very successful in the use of quart doses of melted lard with flax-seed tea. As soon as the animal is relieved it usually recuperates rapidly and is liable to a second attack only in exceptional cases."

The evidence derived from the above reports establishes nothing as to the cause of Red-water other than the fact that it usually accompanies acclimation. It discredits the hitherto general belief on the part of veterinarians that low, rank pastures produce it. The necessity of prompt purging is clearly shown by the experience of all the gentlemen whose herds have been affected.

HOOVE.

This disease is caused by the fermentation of green vegeatble food in the rumen of cattle. It usually occurs when cattle are taken from a poor pasture to one contain-

ing luxuriant vegetation, such as succulent grass, field peas, etc. The hungry animals eat too much and so over load the rumen that it ceases to circulate the food, and a rapid fermentation takes place which generates a volume of gass, which in its effort to escape causes serious uneasiness and often intense suffering in the animal affected.

Youatt mentions the following symptoms of Hoove, viz: "The animal gradually becomes oppressed and distressed. It ceases to eat; it does not ruminate; it scarcely moves, but stands with its head extended, breathing heavily and moaning. The whole belly is blown up; this is particularly evident at the flanks, and most of all at the left flank, under which the posterior division of the rumen lies. The rumen in cattle is scantily supplied with either blood-vessels or nerves, and therefore the brain is seldom much affected in an early stage of Hoove. Swelling, unwillingness to move, and laborious breathing, are the first and distinguishing symptoms." In proportion as the rumen is distended by the gas the possibility of its escape is lessened, and the difficulty of administering medicine increased since the entrance to the rumen is closed by the distention of the latter. The unnatural size of the stomach causes it to press upon other vital organs, producing labored breathing, interrupting the circulation of the blood and finally causing inflammation which extends to the brain. Unless speedily relieved death must ensue. In simple cases the gas may be extricated by causing the animal to move rapidly, and by the concussion occasioned by the jolting of the contents of the stomach, open the entrance to the rumen and allow the escape of the accumulated gas. Alkalies or oils are also efficacious in the early stages of the disease, before the entrance to the rumen has been close against their admission by too great distension. In severe cases, either the probang, stomach pump, knife or trochar, must be used.

The probang, which consists of a flexible tube termi-

nated by a rounded and perforated solid, may be passed down the throat of the animal and the rounded extremity forced through the œsophagean canal by means of a stilett within the tube, the stilett withdrawn and the gas allowed to pass out. As soon as the belly falls, and but little gas escapes, the tube should be withdrawn. If the animal swells again, the probang may be re-introduced. This necessity may often arise as the probang simply removes the gas already generated and does not remove the cause. The tube should not remain in the gullet long at a time. The stomach-pump is superior to the probang, since by its use the gas may not only be removed, but medicines injected to remove the producing cause of the disease.

While the knife inserted into the rumen above the flank effectually removes the gas there is danger of portions of the contents of the rumen falling into the cavity of the abdomen and proving a source of irritation, inflammation and finally of death. To prevent this, the trochar, which consists of a stilett encased in a triangular silver tube, is substituted for the knife, the stilett is withdrawn from the wound, leaving the silver tube in the wound. This penetrates several inches into the rumen and out through the skin and effectually prevents the escape of the contents of the rumen into the cavity of the abdomen, while it allows the free and continuous escape of the gas.

Youatt describes the point at which the knife or trochar should be inserted as follows: "Suppose a line be drawn close along the vertebræ, from the haunch-bone to the last rib, and two other lines of equal length to extend down the flank, so as to form an equilateral triangle; the apex of the triangle, or the point where these lines meet, would be the proper place for the operation, for there is no danger of wounding either the spleen or the kidney." After the animal is relieved the following treatment is suggested by Mr. Youatt: "A pound of epsom salts should be administered with an ounce of carraway powder,

and half an ounce of ginger; and on several successive mornings, four ounces of Epsom salts, two of powdered gentian, and half an ounce of ginger should be given," to restore as speedily as possible healthy action of the rumen.

If an animal is gorged with grain, soda and Epsom salts should be promptly administered.

PUERPERAL FEVER.

This disease may generally be prevented by proper attention to the cows just before, during and immediately after calving.

Before calving, and as maturity approaches, if the cow or heifer is not on grass, she should have laxative diet, such as bran mash, but no heating food, such as corn meal, cotton seed meal, etc. If her condition is already very high, she should be kept on lean pasture for some weeks before calving. It is generally cows in high condition and deep milkers that are affected with milk fever.

The udder should be carefully watched for some days before the time for calving when there is a rapid secretion of milk taking place, and prompt measures adopted to prevent hardening or caking of the udder. If the milk will flow, a portion of it should be drawn each day to relieve the distention and prevent inflammation. If, as is sometimes the case, the milk cannot be drawn, the udder and teats should be thoroughly rubbed with arnica and hog's lard, mixed in equal quantities, using the hand for rubbing, as the warmth of the hand will assist the absorbtion of the ointment. If these precautions are used, the cow carefully fed on warm, laxitive mashes for several days after calving, and kept from cold rains and winds, cases of puerperal fever will be very rare. If, however, a case does occur, prompt attention is demanded. It usually occurs the second or third day after calving, when there is a rapid determination of blood to the udder to supply the milk secretions. If such secretion is then interrupted by cold

or an inflamed condition of the udder, the whole system becomes deranged, and what is known as puerperal or milk fever ensues. Allen gives the following

Symptoms—"The disease is first perceived by the animal refraining from food, and looking dull and heavy. A cold, shivering fit comes on, accompanied with so much debility that the beast commonly drops, and is unable to rise until she obtains some relief from medicine. The animal becomes very restless, and appears to experience great pain in the body, as she often looks towards the flanks and kicks with her feet, and seems very much distressed. The head, as the disease proceeds, is in general so severely affected, that the cow loses her senses, and will knock and bruise her head against anything, and do herself much injury, if great care is not taken. The pulse is quick, being about 70 in a minute, and the tongue parching dry. The bowels are costive, and there is no secretion of milk. . . . As the disease advances, the belly becomes enlarged; if purging medicines lessen the swelling in the body it is a good sign; but if they are made use of, and the belly still increases in size, there are little hopes of her recovery.

"A purging drink should always be administered as early as possible. The following is highly recommended by some practitioners:

Nitre	2 ounces
Ginger, powdered	1 ounce
Epsom salts	1 pound
Anise seed, powdered	1 ounce
Treacle	4 ounces

"Pour three pints of boiling water upon the ingredients, and let them be given when new milk warm."

Epsom salts alone or lard will answer if the other ingredients are not at hand—dose, one pound to one and one-half pounds of the salts, or one quart of melted lard, to be repeated in half these quantities, if no action is se-

cured in eight or ten hours. If the medicine does not act freely, clysters may be used to advantage. As soon as the bowels are opened and the fever reduced, an effort should be made to restore the tone of the system. The following is recommended by Allen in his work on "American Cattle:"

Salt of tartar	½ ounce.
Oil of turpentine	1 ounce.
Ginger, powdered	½ ounce.
Flour of mustard	2 ounces.
Grains of Paradise, powdered	½ ounce.
Treacle	4 tablespoonfuls.
Caraway seed, powdered	2 ounces.
Anise seed, powdered	2 ounces.

Mixed and given in a quart of warm gruel, to which may be added a wine-glass of gin or brandy.

"This drink will tend to invigorate the system and promote the secretion of milk. It may be repeated once a day, or every other day, for three or four times. Should the bowels be inclined to be bound any time during the complaint, recourse to a purging drink should be had immediately. Cows afflicted with the milk fever should be taken great care of, and be well nursed. It is requisite that the stall where they lie should be well littered; and it is frequently necessary that, when they are cold and shivering, they should be covered with a blanket or some other warm clothing. To assist in subduing the inflammation of the udder, it should be rubbed two or three times a day, about half an hour each time, with soft soap, or pipe-clay and cold spring-water.

"To solicit the flow of milk, the paps should be drawn occasionally; it is a good sign when the milk begins to be secreted. As they are frequently unable to take a sufficient quantity to support themselves, it becomes necessary to horn some nutritious food into them. Good gruel is well adapted for this purpose, and two or three quarts should be given three or four times a day. Linseed por-

ridge, sweetened with treacle, is also proper to be given at this time. The beast must be constantly attended to when the head is much affected, otherwise she may do herself some serious injury." Water-cure has been satisfactorily used in this and all other inflammatory diseases of cattle.

CHOKING.

Cows are liable to be choked by attempting to swallow ears of corn, potatoes, etc. When this occurs, resort must be had to the probang to force the obstruction forward into the stomach. If a regular probang is not at hand, a temporary one may be constructed of a piece of grape-vine or rattan, about five feet in length, wrapped at the ends with thread, and covered with a disc of soft leather. This, well greased, may answer as a substitute for a probang in cases of emergency.

GARGET, OR SWELLING OF THE UDDER.

This disease, like puerperal fever, is generally the result either of neglect or bad management. It usually attacks deep milkers or heifers with the first calf. Cows in high condition are more subject to this disorder than those in a lean or moderately good condition. If the bag fills to such an extent before calving as to risk inflammation, a portion of the milk should be drawn daily to relieve the distension. If this is not done, the milk, remaining in the udder so long, will coagulate and produce inflammation in a portion or all of the udder, and caking of the udder results. If such symptoms are observed after the birth of the calf, it should be induced to suck the teat of the affected part before too great inflammation and hardening occurs. If not relieved in its early stages, the udder should be thoroughly rubbed several times daily with melted lard and arnica mixed in equal quantities. This well rubbed in with the hand will generally give relief. If much fever

prevails in the udder, an India-rubber sack, large enough to cover the udder, should be tied over it, and kept filled with soft water of about 60° or 65° F. The water should be frequently renewed.

WOUNDS, SPRAINS AND BRUISES

Are best treated with cold water, keeping the injured parts bound with cloths, which are kept saturated with cold water. This keeps down local fever, and allows a healthy action in the parts affected, thus insuring speedy recovery. Even refractory animals soon become manage able under this treatment, so great is the relief afforded.

LOSS OF CUD

Is not a disease but a symptom or consequence of disease. It results from either debility or some inflammatory disease. The remedy should be applied to the disease of which the "loss of cud" is the symptom. The character of the cause must first be determined by a careful examination of the animal before attempting a remedy. It generally results from some derangement of the digestive organs.

LICE AND TICKS.

Cattle in low condition are often seriously injured by these parasites—by the former in winter and spring, the latter in early summer. Lard and Scotch snuff, or Cayenne pepper well rubbed over the hide, will destroy them. Lard or oil of any kind used alone will also prove effectual. Mercurial ointments and sulphur should not be used on account of their danger to the animals themselves. Kerosene oil rubbed on the hides of the affected ani nals will prove effectual for the removal of either lice or ticks.

ABORTION

Has never been troublesome in Southern herds though quite troublesome in some localities at the North. As a cow that has once aborted is likely to repeat the accident,

she should be either fattened for the butcher or removed from the rest of the herd, to avoid all sympathetic influence on others.

"HORN AIL" OR "HOLLOW HORN"

Is a symptom of some derangement of the system, and not a disease. Boring the horn and pouring into it all sorts of villainous compounds only increase the suffering of the animal without striking at the cause of the trouble.

POISONING.

Cattle are sometimes poisoned in early spring by eating plants, such as ivy and wild parsnip, water hemlock, etc. The symptoms "are principally sudden swelling, with a peculiar stupor, in the early stages of the attack; cessation of rumination; a change in the quality of the milk, which becomes thin and serous, and presently ceases to be secreted; the refusal of all the solid food and eagerness after water; quickening of the pulse, which yet becomes small, and, in some cases, scarcely to be felt; and the animal frequently grinds the teeth, and paws, and rolls as if it felt severe colic pains. In a few instances the stupor passes over and a degree of excitement and blind fury succeeds, which has been mistaken for madness—*Youatt.*" These vegetable poisons cannot be neutralized by medicines; the only remedies are to be found in the use of the stomach-pump and active purgatives. Give a quart of melted lard or one and half pounds of Epsom salts, and repeat the doses if no action is had in from four to six hours. With the pump repeatedly inject and withdraw warm water, and finally fill the rumen with warm water. If poisoned by the use of corrosive sublimate give the whites of several eggs beaten with thick gruel, repeating it every hour.

CHAPTER VI.

GRASSES AND OTHER FORAGE PLANTS ADAPTED TO GEORGIA.

As success in rearing cattle depends upon the abundance and quality of food suited to their consumption, available to the breeder, "A Manual on Cattle" would not be complete unless it conveyed some information as to the most economical and profitable means of supplying the food necessary for securing the best results in rearing them. Since cattle-breeding has hitherto received but little attention in Georgia, but little thought has been given to the production of forage, more than to supply food for horses and mules used in the cultivation of the farms. In the larger part of the State, neither summer pasturage nor winter forage is supplied artificially, except to work oxen and milch cows.

Now that the stock of cattle in the State is being rapidly improved by the introduction of thoroughbreds which are either bred pure or used to "grade up" the "natives," the farmers of the State, recognizing the fact that to secure and maintain improvement, good pastures or abundant forage for soil-feeding are necessary, are turning their attention, more than ever before, to the subject of forage production.

The object of this chapter, therefore, will be to supply, to those who desire to improve their stock, the needed information in a concise and condensed form. A general discussion of forage plants will not be undertaken, but the attention of the reader will be invited to a practical discussion of those plants which may be profitably cultivated within the borders of this State. Technical names will be avoided as far as practicable.

The grasses which have been and may be profitably cultivated in Georgia are orchard grass, herds grass or red top, tall meadow oat grass, Italian rye grass, blue grass, timothy, Bermuda grass, crab grass and wild rye or Terrell grass. To these may be added (since they are true grasses) rye, barley, oats, Indian corn, and the millets.

Among the leguminous or pod-bearing plants may be mentioned red clover, white clover, lucerne, spotted medick, common vetch and the cow-pea.

ORCHARD GRASS,

Is the most reliable of the cultivated grasses for Middle and North Georgia. It affords abundant pasturage in the late fall and early spring; or, if not grazed during the fall, affords good pasturage during the winter months. It grows in tussocks, and hence is not suited for lawns, where a smooth, even surface is desired. In order to secure a "full stand" very heavy seeding is necessary. The seed is light and chaffy, and hence not less than two bushels should be sown to the acre. The best results are obtained by sowing on well-prepared land in September. Like most other grasses, it succeeds best on stiff lands, failing on those below the grade of sandy loam. Orchard grass is valued more for grazing than as a hay grass. If, however, it is cut when in bloom, it makes very good hay—if not cut till the seed are formed it becomes woody and almost valueless for hay.

Unless saving pure seed is the object it should never be sown alone, but mixed with other grasses, as hereafter directed.

When cut for seed the stems above the undermath should be cut, and then the balance, which will embrace the bulk of the crop, may be cut and cured for hay.

Orchard grass grows very well on land partially shaded by trees. Many of our woodlands may be converted into valuable pastures by cutting out the undergrowth, thinning

the larger trees, preparing the land and sowing orchard grass. Orchard grass, being perennial, affords many successive crops from one seeding if not overrun by weeds and other grasses, and annually top-dressed to compensate for the removal of annual crops in hay or pasturage.

TALL MEADOW OAT GRASS.

This is a valuable grass, very similar in its habits of growth to orchard grass, more valuable for hay, will grow better on sandy lands, but requires greater fertility. It ripens very nearly with the orchard grass, and has the peculiarity of ripening seed while the straw is yet green. In consequence of this habit the undermath makes excellent hay after the seed are saved. In many respects this is superior to orchard grass, but requires richer soil. Just here it is proper to remark that no grass need be expected to succeed well on very poor soil. The meadow oat grass is perennial, and hence, other things being equal, more valuable than annual grasses.

It should be sown in August or September, at the rate of two bushels per acre.

Neither orchard nor meadow oat grass should be pastured during the summer, their chief value consisting in the winter pasturage which they afford. Ripening at the same time, they may be sown together, to give variety to the hay as well as to the pasturage. If sown together one bushel of each should be used.

BLUE GRASS

Is more valuable in Georgia as a lawn grass than for stock. In the northern part of the State, however, especially on lands abounding in lime, either naturally or artificially supplied, blue grass will afford a valuable addition to permanent pastures, on which, however, if heavily grazed, it will eventually root out other grasses.

Since it is stoloniferous, spreading from the root under-

ground, the trampling of stock and close grazing seem to facilitate its spreading and enable it the better to resist our climate. It is not valued as a hay-producer, but, like orchard and meadow oat grass, affords superior winter pasturage if not grazed in the fall. Stock are perhaps more fond of it than of any other perennial grass except Bermuda. It will not live through our summers on sandy soils unless partially shaded and supplied with an abundance of moisture.

When sown with other grasses it is scarcely perceptible until the second year. If sown alone, on rich and well-prepared soil, free from weed and grass seed, it makes a sod the first year.

HERDS GRASS, OR RED-TOP,

Is particularly adapted to moist soils, and will grow even on pipe-clay land, where nothing else useful will grow. It is perennial, makes good hay and affords very good pasturage in early spring. It grows on uplands, but succeeds best on lands too moist for orchard or meadow oat grass, it should be sown in September on bottom lands. It ripens later than orchard and meadow oat grass, but is sufficiently advanced when they are in condition to cut to make good hay, and hence may, to some extent, be mixed with them. It does better, however, mixed with

TIMOTHY.

which gives satisfactory results only on drained bottom land. This is recommended only for hay, for which it is admirably adapted. It makes very little aftermath, and hence affords poor fall grazing. Having tuberous roots, it is injured by grazing. It will succeed only in the northern part of the State, in mountain coves, and on creek and river bottoms. It will not answer for general cultivation in the State.

GUINEA GRASS

Has been cultivated successfully by some farmers for hay. Its root is perennial, but the top is killed by the first severe frost. It has a fleshy cane root, which propagates rapidly under ground under favorable circumstances, and which is exterminated with great difficulty—the principal objection to the plant.

It should be sown only on land intended to be permanently devoted to grass, on account of the difficulty of exterminating it when once well set. On rich land it affords several cuttings of hay of medium quality.

It should be cut when about three feet high and before it blooms. If left standing as long as is usual with other grasses it becomes too hard and woody to make good hay.

BERMUDA GRASS

Is the only perennial grass which can be relied upon for summer pasturage. Those already mentioned are peculiarly adapted to furnishing winter pasturage, but to do this they must *not be grazed in summer*.

The Bermuda affords summer pasturage unsurpassed in richness and reliability, and none is more relished by stock of every description. It affords an impenetrable sod, which completely protects the soil from washing and injury by the trampling of stock, while, in common with other perennial grasses, it makes annual contributions of humus to the soil and gradually improves its fertility. It can be relied upon to produce hay only on bottom land, or on land supplied with moisture throughout the summer. On such lands it yields an immense quantity of hay of very superior quality. On uplands it does not attain sufficient height to be cut for hay.

Bermuda grass propagates by root under ground and by surface runners, which take root at every joint. It bears no seed, and hence is easily confined within any desired limits,

if reasonable precaution is used by the proprietor of the lands to prevent scattering the root by means of the plow, washing rains or creeks.

It can be readily and rapidly propagated by burying portions of the root as follows: Prepare the soil as for corn, lay off rows three feet apart with a small plow, which will not render the surface of the soil very uneven, drop pieces of the root a few inches long every two feet in the drill, cover with the foot and *tread on it* to bring the earth in closer contact with the root and thus facilitate its growth. This should be done in early spring—say at the time of planting corn. The runners will rapidly spread over the space between the rows, taking root as they advance, so that on good land there will be a good sod by the second year. The land should be rolled after planting.

Bermuda is eminently the summer grass of the South, and will prove a blessing to Southern agriculture when the prejudices which now prevail against it shall have been overcome and it shall take the place in our system which it is, beyond question, destined to fill.

SPOTTED MEDICK,

Sometimes called burr clover, though it is not, strictly speaking, a clover at all, sown on Bermuda sod, grows while the Bermuda is dormant, and affords winter and spring pasturage, thus supplementing the Bermuda and affording perennial pasturage. It gets its name from the form of its seed pods, which resemble small burs. These burrs are formed by the spiral coil of the seed-pod.

The seed should be sown in August or September, on and prepared for their reception, if intended to be grown alone or on Bermuda sod, early in August. Those who have grown medick on Bermuda sod have been highly pleased with the results.

VETCH.

There is a variety of winter-growing vetch which grows during winter and spring on Bermuda sod, as does the spotted medick. They both have slender stems, which trail upon the ground if not supported by other vegetation, both make a quantity of seed, and both spring up spontaneously year after year where the seed matures and falls. The pods of the vetch turn black as they mature, and as soon as ripe burst and scatter the seed. It is hence very difficult to save the seed of this plant.

The burrs of the medick fall upon the ground when the plant matures, early in June, and may be raked up in quantities. This burr is troublesome on account of adhering to the wool of sheep when they lie upon the ground where it has fallen.

Both of these plants are annuals, but have the merit of propagating themselves spontaneously after they have been once started. They do not interfere with cultivated crops, and are easily exterminated. Their principal value arises from the facts that they grow on the Bermuda sod during winter and spring, and re-seed themselves.

ITALIAN RYE GRASS,

Affords excellent winter pasturage, but, being an annual, will not be cultivated so long as we have such perennials as orchard and meadow oat grass.

CRAB GRASS,

Next to the Bermuda, is our best reliance for summer pasturage and produces a large quantity of hay when harvested at the proper stage of maturity—when in bloom. Heavy crops of hay may be made on good land by preparing thoroughly in May, killing all growth then on the soil and allowing the crab-grass to take entire possession. There is generally seed enough already on soil that was

cultivated the year before, to secure a full stand. Stock of all kinds are very fond of well-cured crab-grass hay. If seasons are favorable fine crops of this hay may often be saved from land from which small grain has been harvested. The principal value of crab-grass, however, arises from the summer pasturage it affords, being a spontaneous growth and costing nothing. The hay from this grass is difficult to cure and analysis shows it to be little superior to oatstraw.

OTHER GRASSES.

Besides the foregoing, which are generally recognized as grasses, there are other true grasses which are usually cultivated for their seed and hence are ordinarily classed in accordance with the use made of them, but which are, nevertheless, valuable for the purposes for which the foregoing are commonly cultivated. Among these are rye, barley, oats, Indian corn and the millets.

BARLEY

Has been sown on Southern plantations for winter grazing on a small scale for more than half a century and is esteemed highly for that purpose by all who have used it. It should be sown on very rich soil in August at the rate of not less than three bushels per acre—more will be better. Thus sown it affords good pasturage from the time the summer grasses begin to fail until Spring. A more economical method of using it, however, is by cutting it daily and feeding it on the soiling plan to the stock. Fed in this way a given area will supply four times as many stock as can be pastured upon it, besides avoiding injury to the land by trampling while wet.

Besides, there are very few days during our winters in which the barley may not be cut and fed to the stock, while there are sometimes weeks at a time when the soil

is not in a suitable condition for pasturing. There is no waste in cutting, while much of the barley is either pulled up, soiled by the excrement of the animals, or destroyed by their hoofs in grazing. It is but little more trouble to cut and feed the barley than to turn the stock to and from the pasture.

RYE

May be treated in the same way as barley, and does not require such fertile soil to make a profitable crop. The two may be mixed to give variety, and sown if intended for soiling, in drills a foot or fifteen inches apart, at the rate of two bushels of barley and one of rye to the acre. Sown thick, the stalks are forced to grow up straight, and consequently cutting may be commenced as early in the fall as it is needed. If intended for grazing, the same quantity may be sown broadcast.

No other grass or combination of grasses will supply so much green food of such good quality as barley and rye mixed. Where orchard grass and meadow oat grass will grow, however, every farm should have a liberal area devoted to them.

With the facilities offerred by the soil and climate of Georgia for supplying green food throughout the winter, it is surprising that more attention has not been given to winter dairying. As before remarked, there is no excuse for white, or otherwise inferior butter anywhere in Georgia, at any season of the year. If the people of Georgia will fully avail themselves of their natural advantages of soil and climate, no prophetic vision is necessary to discover happiness and prosperity in the near future.

OATS

While not especially adapted to winter pasturage may be made, to an important extent, supplementary to

other more valuable winter grasses; but whether cut when in bloom to make hay, or allowed to ripen for the grain, furnish perhaps the cheapest forage crop for the middle and southern parts of the State.

INDIAN CORN

Sown broadcast on very fertile soil or planted very thich in drills at the rate of from four to six bushels per acre will yield, perhaps, more forage per acre than any other plant adapted to the South, the only obstacle to its culture lying in the difficulty of properly curing the forage when cut green. It should, like other grasses saved for hay, be cut when in full bloom. It is excellent whether cut for soiling purposes or cured for winter forage. If cut the first time before the joints are formed it will put out and make a fine second crop. The blades which are harvested at the first cutting would, if not so harvested, be of little value if allowed to remain, as is usually done, until the plant blooms, as they usually die from the influence of the shade before the crop is gathered.

GERMAN MILLET.

If sown very thickly on fertile soil so as to reduce the size of the stalks, and cut when in bloom before the stems have become hard and woody, makes a large quantity of hay of rather inferior quality. Being of very rapid growth it is an exhausting crop, and hence has not met with very great favor with the farmers of Georgia.

HUNGARIAN MILLET

Being smaller in growth than the German, and making in as short time, answers the purpose of an annual hay plant better than the latter, and makes in consequence of the smaller stem a better quality of hay. Neither, however, has met with much favor with those who have tried them.

CAT TAIL MILLET,

Recently named by Peter Henderson, "Pearl Millet," has been planted for half a century in small patches for the purpose of feeding green to mules and milch cows, during the summer. It is very valuable for this purpose, affording repeated cuttings of succulent food, which is relished by stock moderately well, but not so much as green corn, clover or lucerne. It should be sown in drills, on fertile soil, and cultivated. It supplies an immense amount of green forage, in good seasons, may be cut half a dozen times, and supplements pastures in dry weather better than any other plant, because of the repeated cuttings that can be made from it during the summer. It should be cut before it joints, to ensure a prompt renewal of the growth. The principal value of this plant is for soiling purposes. While it may be saved for winter feeding it cures with difficulty, and makes rather inferior forage. The only circumstances under which it should be cured for hay are when the supply is greater than the immediate demand. In good seasons when other forage is abundant, and the growth of the millet very rapid, this will sometimes happen, as it is necessary to keep it cut down before it joints, if repeated succulent crops are expected. Whether needed, therefore, for immediate use or not, the whole patch, except that reserved for seed, should be cut over every few weeks, to keep up a succession of succulent crops. The plant is very small and tender when it first germinates, and hence the seed should not be planted until the soil is warm, in spring—about the time of planting cotton.

LEGUMINOUS PLANTS—RED CLOVER.

The cultivation of red clover need not be attempted in Georgia, except on soils containing a large per cent. of clay, and those of a fair degree of fertility. It is very justly highly prized in climates better adapted to its

growth than ours as a soil improver, but in Georgia does not compare with the field pea (bean), for this purpose. In our climate, red clover may be sown in September or March, if sown alone or with grass seed, but if sown with small grain it should be sown in September. Even if sown alone September is the better time, that it may acquire sufficient root to withstand our mild winter, but more especially that it may acquire sufficient root by summer to pass uninjured through the droughts, which usually occur in July or August. In the Northern and Middle States, clover seed are generally sown in early spring, to avoid being winter killed; here we must guard more against summer killing, and hence sow in the fall for the reasons stated above. The soil should of thoroughly prepared before sowing the seed, which should not be covered exceeding half an inch in depth. If sown just before a rain on freshly prepared soil they need not be covered at all. Where sown with small grain the return for the labor of preparing the soil, and the fertilizers used, is in the crop of small grain harvested, no hay crop is gathered till the second. If sown alone, two crops of hay are gathered the first year, which will usually equal the value of the small grain crop gathered, when sown together. The objection to sowing with small grain in our climate is that the clover is dwarfed by the occupancy of the soil by the grain, until the latter is harvested, when the tender plants are suddenly exposed to the heat of the sun, to which, if drought ensues, they usually succumb. All experience in Georgia is in favor of sowing clover and the grasses without small grain, as the surest means of securing a stand.

Red clover, however, should never be sown alone, unless seed are to be saved from the aftermath, and even if this is expected, the grasses will not materially interfere with it, since they will not mature seed in the aftermath.

Orchard grass and meadow oat grass mature with red clover, and hence are ready for the hay harvest at the same time. One or both of these grasses should be mixed with clover—they interfere with each other very little, require to a large extent different elements of plant food, and present a variety of diet to the stock in the hay.

The second crop of clover, which salivates horses, has no such injurious effect upon cattle either in its green state or when cured as hay.

Red clover is a biennial plant, but re-seeds itself very well in our climate. The seed will lie in the ground many years and then germinate, when brought sufficiently near the surface.

If sown alone, twelve pounds of pure seed will give a good stand on an acre. This is more than is usually sown, but the additional cost is well repaid in the greater certainty of securing a stand.

WHITE CLOVER

Is never sown alone, but when mixed with the grasses, such as orchard, meadow oat grass, herds grass, or timothy, it makes a valuable undermath, though being perennial, like blue grass, it is disposed to crowd out its neighbors. It does not grow tall enough to be valuable for hay when planted alone, but in connection with red clover and the grasses adds much to the pasturage.

LUCERNE

Is exceedingly valuable, either for hay or for green soiling, on account of the early and repeated cuttings it affords, and for its superior nutritious qualities. It should never be grazed for the reason that the continued close biting of stock destroys the plants. It should be sown alone in drills sufficiently wide to admit the plow—fifteen or eighteen inches apart. Lucerne is very tender when young, and is easily overrun by weeds and grass. It is

hence important to have the soil to be planted as free as possible of the seeds of weeds and grass, and very thoroughly prepared by repeated plowing and harrowing.

It should be planted early in September, after the summer weeds and grasses have ceased to germinate, and yet early enough for the lucerne to take good hold on the ground before winter. If planted thus early on fertile soil, it will be sufficiently advanced before ordinary spring vegetation starts to admit of thorough working. This working is necessary to protect it from being overgrown by wild vegetation, and hence all attempts at broadcast sowing have proved failures. It needs annual cultivation and manuring, but amply repays, by its large yield of most nutritious green food or hay, those who will give it the attention necessary to success in its cultivation. It needs to be cut, whether to be fed green or cured for hay, when the first blooms appear. If left till in full bloom, the stems become hard and woody. It may be cut as often as six times in very favorable seasons, and seldom less than three times in the most unfavorable seasons.

After a stand is once secured, if properly cultivated and manured, it will afford a number of cuttings annually for more than a quarter of a century. It sends its tap-root so deeply into the soil that it is affected less by drouth than most of our cultivated plants. It has been known to descend eight feet vertically into the sub-soil. Satisfactory results in the cultivation of lucerne may not be expected on poor or poorly prepared soil. It will succeed well in any part of Georgia with proper preparation of the soil, and annual manuring and cultivation. Every farm should have a few acres of it.

MIXED GRASSES AND LEGUMES.

As before remarked, unless saving pure seed is the object of cultivation, none of the grasses or legumes, except lucerne, should be sown alone either for pasture or for

hay. Stock of all kinds prefer a variety of food, and will consume more and thrive better if supplied with a variety than if fed on a single article, however nutritious.

For pasturage or hay, the following mixture is recommended on uplands:

Orchard grass	per acre,	1 bushel
Tall Meadow oat grass	"	1 "
Red Clover	"	8 lbs.
White Clover	"	3 "

If the meadow oat grass-seed cannot be obtained, sow two bushels of orchard grass.

If a permanent pasture or lawn is desired, sow in addition to the above, one bushel of blue-grass seed.

On bottom lands sow of

Herd's grass, per acre,	½ bushel
Timothy	12 lbs.
White Clover	3 "

If practicable, sow all the grasses and legumes in September without small grain.

Neither the grasses nor legumes should be grazed the spring after they are sown. Cut for hay once the first year and allow the aftermath to grow till late fall, when stock may be turned on. Neither should the cultivated grasses or legumes be grazed closely, no matter of how long standing, during our summer months—their roots need protection from our summer sun.

The Bermuda and crab grass are pre-eminently our summer pasture grasses. The cultivated grasses and clovers afford pasturage during the late fall, winter and early spring, and supplement Bermuda and crab grass. Add to these lucerne and a mixture of rye and barley for winter and spring soiling, the cat-tail millet for summer soiling and forage corn for summer soiling and dry food in winter, and we have a supply of forage for cattle unsurpassed in any country on the globe. All that is needed is for the farmers to turn their attention to these matters to make

winter and summer dairying not only possible, but eminently successful in Georgia. Very few have given the subject the attention its importance would justify. Good butter sells in our markets at from 40 cents to 45 cents; poor butter at from 20 cents to 25 cents.

ENSILAGE.

Within the last few years the experiment of storing green forage in silos, or pits in the ground, has been successfully made in the United States. It has been practiced in Europe for some years but has been successfully introduced into the United States during the last three years. What effect this will have upon Southern husbandry it is impossible to foresee, but it promises to increase our already superior facilities for winter feeding by enabling the farmer to promptly harvest such rough provender as drilled corn and preserve it, by packing it into the silo, and excluding the air from it, for winter use in almost the same condition as when cut. There is nothing to prevent those who farm on a large scale in Georgia from availing themselves of ensilage, but the first cost of the silo will be too great to justify its use by small farmers.

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